ELECTRICAL REVIEW

[ILLUSTRATED.]

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Application of Electricity to Weaving.

A manufacturer of Roubaix, M. Henry Buisini, has just discovered a very curious application of electricity to looms. He adopts an indicator which strikes when a thread in the warp breaks, and thus saves the warper from taking out any of his work to find the flaw, and he need not pay such close attention to the quickly moving threads which is so injurious to the sight. The invention can be applied to power-looms.

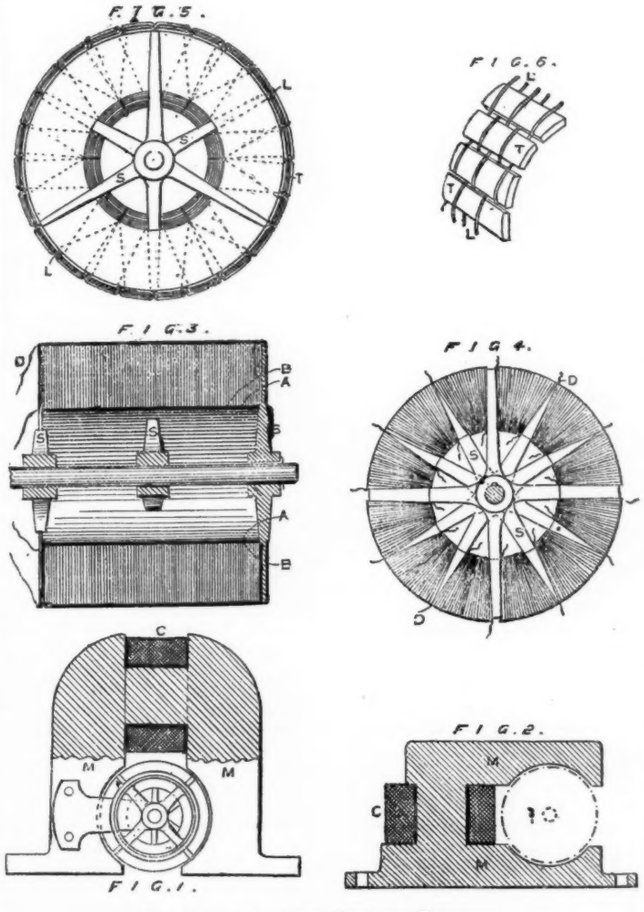
Prof. S. P. Thompson's Improved Dynamo.

About four years ago, says the *English Mechanic*, Prof. S. P. Thompson obtained a patent for improvements in connection with simple dynamo-electric machines, in which the field-magnet is in one piece without joint. A short time back he obtained another patent (No. 7,860, 1886), which embodies some improvements in the armature, the object being the obtaining of a more efficient machine, having greater electrical output in proportion to its size and cost, less liable to wasteful heating in the electro-magnets or in the polar surfaces thereof, and having in general better magnetic and electric conductivity. Professor Thompson employs a single core to receive the field-magnet coil, and makes the core shorter and thicker in proportion than in the older form of machine. He also prefers, for convenience of winding, to make it straight rather than arched. The core which receives the coil may be made in one with the pole pieces by casting or otherwise, or it may be of wrought iron, the pole pieces being cast upon it, or screwed or riveted to it. The field-magnet itself serves as a framework for the machine, and its pole pieces or either of them may constitute the bed-plate of the machine, the magnets themselves being of great solidity and mechanical strength, and presenting the advantage of a magnetic structure without joints. The field magnets may be wound and excited in any of the ways known in the construction of dynamo machines, the coils being joined either in series with or as a shunt to the external circuit, or they may be separately excited, or they may be excited in any combination of these ways, according to the circumstances in which the machine is to be used.

Fig. 1 and Fig. 2 illustrate the two ways of forming the field-magnets of the improved machine, the magnets themselves *M M* being of great solidity, having great mechanical strength, and possessing the advantage of a magnetic structure without joint. The coils are shown in position at *C C*. The armature is constructed upon spiders of suitable material, such as a non-magnetic metal, keyed, or otherwise suitably fixed upon the driving-shaft, the spiders being formed with shoulders to receive and support a thin supporting cylinder or mantel, preferably made of thin sheet iron, well insulated from the spiders. The cylinder or mantel may be of some strong insulating material, such as hard vulcanized fiber or dermatine. There may be one or more such cylinders or mantels, each being borne at its ends upon the shoulders of a spider. The cylinders or mantels support and keep in place a number of thin iron washers, which are either plain or toothed externally. The process of construction of the armature frame and core consists in fixing one spider on the shaft by its key or other convenient and suitable mechanical means, then placing upon it one of the cylinders or mantels, then outside this the washers to a suitable number, preferably insulated from one another by sheets of varnished or paraffined paper, or asbestos, or other non conducting material; then the next spider is fixed in position on the shaft thereby securing the cylinder and washers in their proper places, and so on until the requisite number has been provided. Instead of washers of thin iron, iron wire, preferably varnished or oxidized on its surface may be wound upon the cylinder, as in the armature known as Gramme's, to serve as a magnetic core. Outside the core, whether constructed of washers or of wire, a layer of varnished paper or other insulating material is placed. The end washers may for greater strength be made thicker, and be secured to the spiders by screws. The core and frame so constructed secure great strength, requisite magnetic properties, proper insulation, and simplicity of construction. The armature coils are then wound over the core, which may, if so desired, be effected in any ordinary way, either ring-fashion or drum fashion; but the patentee prefers the ring method of winding. When armatures of low resistance are required (such as for electro-plating) he prefers to make the coils of thin copper tape, two, three, four or more pieces of which are laid upon one another to form a single laminated conductor, which, after securing the usual insulation, is wound over the core. This is more flexible than solid copper conductors. In some cases the patentee binds or weaves together the portions of the wires or tapes which lie on the external periphery of the armature, by means of a peripheral lacing of thongs, or straps of leather, catgut, or dermatine, or other similar or suitable material, such as thin metal wires covered with suitable flexible insulation the thongs or straps passing over one conductor and under the next one, and so on, after the manner of wickerwork, thereby holding the wires or tapes firmly in place, and preventing flying.

Where only one external layer of conductors is used, this layer may be woven before the ends of the conducting tapes or wires are drawn through the interior of the ring. Or if more layers than one are wound upon the core frame, the outer layer only of conductors may be thus woven or laced. Figs. 3, 4, 5 and 6 illustrate a method of carrying out the improved construction of armatures, *S S* being the spiders, *A A* the supporting mantels or cylinders, *W W* the iron washers, *B B* the outer layer of insulating material, *D D* the conductors.

In Figs 3 and 4 these are shown as of ordinary insulated wire. In Figs. 5 and 6, they are shown as constructed of copper tape, *T T*. The method of securing the outer conductors by lacing or weaving with thongs or straps, *L L*, is shown at Fig. 6.



NEW DYNAMO OF PROF. SYLVANUS THOMPSON.

The Electric Club.

PAPER ON "ELECTRICTY AND INSURANCE," PRESENTED BY MR. HENRY HINE—RESOLUTIONS ADOPTED.

There was the usual large attendance at the meeting of The Electric Club, at the club rooms in the Hotel Dam, Thursday evening. A special meeting of the Board of Managers was held on the Monday evening preceding and twenty-six new members were elected, and at the business meeting preceding the dinner and discussion Thursday evening several other applications were presented. Mr. W. D. Sargent, General Manager of the New York and New Jersey Telephone Company, was elected member of the Board of Managers, to fill a vacancy. The following gentlemen were among those present at the dinner:

H. C. Davis, Geo. W. Hebard, Geo. M. Phelps, Jr., George Worthington, Judge W. H. Kelley, Henry and William Hine, Chas. W. Price, T. P. Conant, B. B. Nostrand, D. E. Drake, H. D. Lyman, J. M. Robertson H. N. Reed, Lieut. F. W. Toppan, Geo. Coggeshall, C. H. Barney, H. R Garden, C. L. Buckingham, W. R. McDiarmid (Secretary Lamar Insurance Company), George Manson, James Beasley, Mr. Gale, R. W. Ryan, of New York City; Chas. E. Dustin, Hartford; H J. W. Dam, Sacramento; A. J. DeCamp, Prof. W. D. Marks, Geo. F. Porter, H. A. Cleverly, Philadelphia; Fred. A. Gilbert, T. B Doolittle, Boston; James English, New Haven; Col. F A Mason, H. D. Stanley, Bridgeport; C. O. Baker, Jr., A. VanWinkle, Newark; Col. Gardiner Sims, Providence; F. A. Cheney, Troy, N. Y., and others.

The tables in the club dining-room were artistically arranged in form of a horseshoe, President Davis at the head or center, Vice-President Hebard at one end, and Judge W. H. Kelley presiding at the other.

On the conclusion of the dinner, President Davis called on the secretary, Mr. Price, to read certain proposed amendments to the by-laws, which was done and the amendments went over for action at the next regular meeting.

Mr. Henry Hine, of the U. S. Electric Lighting Company, of New York city, then read his paper entitled,

ELECTRICITY AND INSURANCE.

The attitude of the fire insurance interests toward the electric light is a matter of first importance to its users, and consequently, to those engaged in its introduction. The question of its relative safety to other illuminants has been fully discussed, and rules, designed to insure its proper equipment formulated and enforced, but we have not reached that point of cordial co-operation and mutual understanding which is necessary to the best interests of all concerned. Insurance men are apt to be suspicious of the electric light companies, and they in turn are apt to grumble at the insurance companies, and the public seeing this gets wrong ideas as to the whole matter.

Both parties are to blame for this condition of affairs; therefore, that our subject may be discussed in the proper spirit, let us take a very hasty glance at the history of

our past relations, confess to our respective sins and resolve in future to act with mutual confidence and in a way to relieve the public entirely from its present uncertainty on the main question, namely, is the electric light safer than other methods of artificial illumination?

When the electric light was first introduced the electric companies unhesitatingly asserted and advertised the fact that a perfectly safe light was at last discovered. These assertions, in the main honestly made because of ignorance, were soon proved false by the occurrence of fires directly traceable to electric circuits, and, led on by the daily papers, whose reporters found unusual opportunities for displaying their genius in dealing with this mysterious fire-scattering and death-dealing agent, and inspired with a feeling of awe, which was the natural result of profound ignorance of the subject, the public became extremely apprehensive.

In the meantime the insurance companies had awakened to the importance of taking action in regard to the new light, and when they began their investigations so little was really known about the dangers to be avoided and how best to avoid them that necessarily misunderstandings occurred and suspicions were aroused on both sides.

Electric light men accused insurance men of meddling in matters they knew nothing of, of greatly exaggerating existing dangers, and of creating imaginary ones, and the insurance people accused them of doing poor work in order to save in cost of construction. A good deal was felt on both sides that was never expressed, and I well remember when the inspection of an electric light plant was looked upon by both inspector and inspected, as a game in which they were antagonists, each thoroughly believing that the other was trying to get the best of him

As, however, the insurance companies realized more and more the advantages of the electric ligh', and as the electric companies better understood their business, both began to appreciate, little by little, that their interests were identical, until we have now reached a point where it is not a question of establishing a friendship, but rather of making a friendship already existing of the utmost mutual benefit.

The insurance companies should not be blamed for their conservative course in the past, and when we consider the phenomenal development of electric lighting, its widespread use and the tremendous forces which are so freely handled in its generation and distribution, too much praise cannot be given the electric light companies that so little damage has been inflicted on life and property.

To-day I believe that all the insurance association, admit that the electric is as safe as other lights, and some go even farther and do not hesitate to say that it is much safer when properly installed.

Now this is all that the electric light companies claim. We not only freely admit, but take pains to publish the fact that great danger would attend imperfect and careless equipment, but we emphatically assert that such work has not been the rule, and that as installed to-day by the reputable companies, an electric light system, whether arc or incandescent, isolated or central station, continuous, pulsating or alternating current contains fewer elements of danger than lighting by gas or oil.

In this connection it will not be out of place to allude to the recent fatal fire at the Temple Theater in Philadelphia, Pa. An attempt was made to fasten this fire on the electric light, and the proceedings before the coroner's jury have undoubtedly created wrong impressions in the minds of many and done injuries to the electric light interests which were never intended by those conducting these proceedings. The electric light companies should be, and I believe are, in full sympathy with Inspector McDevitt in doing his utmost to ascertain whe'her or not this plant was properly equipped and operated, but, in pointing out by experiment what might occur under certain conditions, he was not careful enough to state that these dangers could be easily avoided. He simply proved what we all admit, that wires and lamps may be elements of danger. With everything his own way he had considerable difficulty in producing fire. How hard would he have had to try with gas? How long could he have kept a a handkerchief wrapped around a gas flame?

The neglect to consider this question of safety relatively is what we complain of, and it undoubtedly works much injustice against the electric light. Again, the burning of the Rhode Island Electric Light Company's Station at Providence, week before last, illustrates how apt the electric light is to be blamed for things of which it is entirely innocent. The fire was at once attributed, by the press and public generally, to the electric current, but investigation has proved beyond question that it was caused by coal gas.

While on this topic I wish to allude to another case of injustice against the electric light companies—unintentional no doubt by its author, but none the less harmful—and at the same time to correct some misconceptions which the public may have as to the attitude of this club. I allude to the paper read here by Dr. Benjamin at our last meeting but one, and, though at our last meeting Mr. Beane clearly showed by statistics how uncalled for were the extreme views expressed in this paper, the fires above alluded to, which have occurred since then, the unfortunate accident which resulted in the death of a line man in this city, the facts that this club has been placed in a false position, and that Dr. Benjamin's paper is used by those opposed to the electric light interests to uphold false views and create wrong impressions, constitute my apology for again alluding to this subject.

Any opinion on matters of this kind, emanating from this club, has peculiar significance and weight,and right here we must go on record that we believe the electric light to be safer than other lights, and that we cannot countenance an opinion that the electric light companies are criminally careless and narrow minded in their business methods. It will not do for this club to, in the least, alarm the already foolishly sensitive public on this subject. While we all agree with Dr. Benjamin that we must take a broad and disinterested view, and not allow our utterances to be in any way misleading to the public, he has been over-cautious, as the general tone of his paper is unjustified. and his insinuations against the electric light companies uncalled for, and not warranted by facts. It is not right that the literature of this club should be used against the interests of a large body of its members, if such literature distorts facts or creates wrong impressions.

What the electric light people desire is more light on this whole subject. We want the insurance men and the public to be educated in these matters, feeling confident that, as they become more familiar with them, their apprehensions will disappear. At the same time we ourselves are anxious to learn, and are learning every day, how to do better work, and are only too happy to encourage any discussion, carried on in the right spirit, which will lead to a more thorough knowledge of the necessities for proper installation and throw light on doubtful points.

The question of the insurance of electric light stations has been so fully discussed of late that it needs none of our attention to-night, more especially as it has been taken up by "manufacturers' mutual companies," in whose hands it is sure to receive intelligent treatment; but there is crying need for a uniform system of rules governing the installation of plants, to be adopted by all the insurance associations throughout the country, which shall be alike acceptable to the electric and insurance interests, and insure a uniform standard of excellence of equipment. The convenience and welfare of the public demand this, and our mutual interests can be well served by agreeing at once on the necessity for such rules, and then taking steps towards their formation and adoption. Our identity of interest should insure careful and thorough consideration of this subject, for as to what these rules shall be there is a chance for considerable difference of opinion.

It is not within the province of this paper to suggest a set of rules, and I should not presume to do so if it were. The work of compiling them should be done by thoroughly competent, and above all, practical persons representing both interests, and they should only be decided on after mature consideration. These persons should constitute regularly organized committees, and proper provision be made for the final adoption by and adhesion to the rules, so formed, by all the electric and insurance companies in the country.

Most, if not all, of the various sets of rules now in force are based on those of the New York Board of Fire Underwriters. It is significant that these rules, the first to be made, and since only slightly modified, have been so closely adhered to and proved so efficient. I attribute this largely to the fact that they possess the great merit of being short and few in number. Is it not a mistake to try and cover every detail of construction by those rules? Insist on the primary requirements for safety, but leave details to those engaged in the business who must be responsible for the proper operation of plants. Possibly our insurance friends are not aware that, in every plant installed, precautions are adopted not required by any rule save the necessity of making it practical and efficient in operation, and the enforcement of a complication of detail rules would often prevent the adoption of the safest method, as it would be absolutely impossible to provide for all cases.

Again, the more the rules enter into details the more difficult is it to obtain thorough inspection. Would not a few simple rules and a well organized and intelligent system of inspection be much more efficient than many and complex rules and the loose inspection which would necessarily result in such a case?

The insurance companies and the public have in the necessities for the successful and economical operation of plants a surer safeguard than in any system of rules which could be devised.

In looking over the various rules now in force a few points have occurred to me which may be of some little value, and I offer them for what they are worth.

Proper conductivity and insulation, and the use of efficient safeguards, in case of accident, are the three essential points to cover, and I believe they can be comprehensively covered by a few simple rules.

On the question of conductivity the present rules differ widely. One requires that the main conductor must equal in weight per foot the wire constituting the circuit of the armature of the dynamo. Another, that all wires used in connecting lamps and other appliances with the generator must have a conductivity at least equal to No. 6 wire "American gauge," and this with no modifying clause as to the system used. Still another, that a wire must be large enough to carry fifty per cent. more current than will ever be required for the lights it supplies, and another that a wire warm to the touch in comparison with another wire is liable to become a source of danger and should be replaced by a larger wire. Not one of these is comprehensive, and I would suggest that a simple and efficient rule would be one which prescribes a certain sectional area of wire per ampere of current. Another point upon which the rules differ greatly is the distance which must be maintained between positive and negative wires. If the plant is properly installed in other respects, it is a question whether, in most systems, it is not safer to have all wires very close together. Some of the rules now in force require that a plant entire must show a certain insulating resistance. The idea of the rule is good, as it is a check on the whole work, but is it fair to require the same insulating resistance in a plant where the electromotive force used is 100 volts as is required where it is 1000 volts? Then again the greater length of wire in an installation the less is its total insulating resistance, though, for a given unit of length, it may measure as high as an equal length in a smaller installation whose total resistance is much greater. It would therefore be unfair to require in large installations the same insulating resistance as in small ones. Would it not be well to avoid this unfairness by requiring a certain insulating resistance per thousand feet of circuit? Differences also exist in the present rules as to the use of fusible strips. These should be required either in both poles all through a system, or only in one but all in the same pole, and there should be a standard metal or alloy used for the strips, and their capacity be regulated by specifying a certain sectional area per ampere of current. Still again the rules do not all require soldered joints. I believe that there can be no argument against, and a great many in favor of soldering all joints between wires, no matter how small or where located. The installation of street circuits, their entrance into buildings, etc., seems to be well covered by the New York rules, as the few fires and accidents here attest.

Underground circuits and alternating currents will of course now claim a share of attention, but no new principles are involved in either which need cause fear among the insurance people that before rules can be made damage may occur. If the insurance people will take hold of this matter in the same spirit which exists to-day among the electric light men, no difficulty will be experienced in formulating an efficient set of rules satisfactory to both and advantageous to the public.

A well organized system of inspection and the employment of intelligent inspectors will do more to insure proper work than rules, more especially because improvements are being made from time to time which necessitate changes in details and in wiring systems. Where there are two ways equally safe, of doing the same thing permit either. Let us aim at general results rather than at minute details. Let us act in such a way as to leave no doubt as to our confidence in each other.

This suggests one other point which I feel I must mention, and that is it seems to me the time has come when insurance men should universally encourage the introduction of the electric light by offering reduced rates where it is used. Some of the associations have recently adopted resolutions to this effect, and this good example should be followed without delay. The general introduction of the electric light will benefit the insurance companies more than any single interest in the country, and we ask for wholehearted support and assistance in return.

In view of the near approach of the semi-annual meeting of the National Electric Light Association at Philadelphia, it seems to me the occasion is a good one for this club to use its influence in accomplishing this much desired reform, and I suggest that through a properly appointed officer or committee we present this matter to that association and urge immediate action thereon.

DISCUSSION.

After the applause that followed the reading of the paper ceased, the President said: "It gives me pleasure to introduce not only as a new member, but as a guest here this evening, Professor Marks, of Philadelphia, who was one of the jury in the investigation of the fire in Philadelphia, mentioned by Mr. Hine."

PROF MARKS: I am somewhat surprised to hear mentioned what I supposed was an entirely local affair. I was the only electrical man on that jury. It seems that Mr. Conner and the two or three electricians there who did the wiring were recommended as electricians. Neither Mr. Singerly nor our Assistant Mayor, Mr. Brotherford, knew anything at all about electricity. Mr. Conner swore that everything was done with the utmost care; that he personally had soldered the joints, while the jury found there twisted wire joints without solder, which could be taken and shaken. Mr. McDevitt, at the risk of his life, went down to the point where the fire had originated and he pulled out two joints, both of them unsoldered. Then Mr. Conner

came on the stand the third day, owned up that his former testimony was false, stated that on the Saturday preceding the opening he had gone to New York, leaving his assistant, who was called "Lightning Jack," on account of his ability to shift scenery in the theatre, with general instructions, and he, under great pressure, because they must open on the following day, twisted up those joints. "Lightning Jack" swore that he had no trade whatever, and that he knew nothing about electricity. He said this man had told him to put in soldered joints; he was not sure whether he did or not; but at any rate he twisted up others It was proven that the fire broke out against the lamp, that the curtain was hauled up immediately beneath the lamp and only required an extra careless pull on the part of the attendant to haul it up over the lamp, and it took fire at that point. The verdict stated that fair workmanship by reliable companies reduced the danger of fire to a minimum, distinctly giving the electric light precedence, so far as the safety is concerned, over other lights. During certain competitive tests I spent six months at least with a row of lamps around me. I was working with a coil of wires around me, and two of them were down in the mercury cups one day and a young man interested in electricity came in. He was one of those who never can see anything without putting their hands on it. He grabbed this coil of wire, and he went across the place, and he turned on me and said: "I don't see how you dare to work with so uncertain a thing as electricity." I said to him. "Electricity is the most certain thing on earth. You are the uncertain factor." (Applause.) I think that the Electric Exhibition at Philadelphia did more to prove the perfect safety and perfect feasibility of introducing the electric light in a public way than almost any argument that the electric light men can bring forward. (Applause.)

Mr. Hebard: I believe that the invitations extended by members of this club to the underwriters of this city has awakened discussions among the Board of Underwriters, and among the leading spirits of the insurance companies in this city, which will tend towards a much closer intercourse than we have had in the past. I hope to see a large representation of the underwriters in our club as active members. There is a feeling on their part that if they came here as guests they would hardly be as free to participate in discussions as they would if they were here by right, and I know in some instances that that is the reason why some of the gentlemen are not here to-night. With regard to the paper that Mr. Hine read I am entirely in sympathy with it.

I think, if I understood Mr. Hine's paper, his strictures were with reference to the manner with which the Temple Theater experiments were conducted, relatively, and not to the findings of the jury.

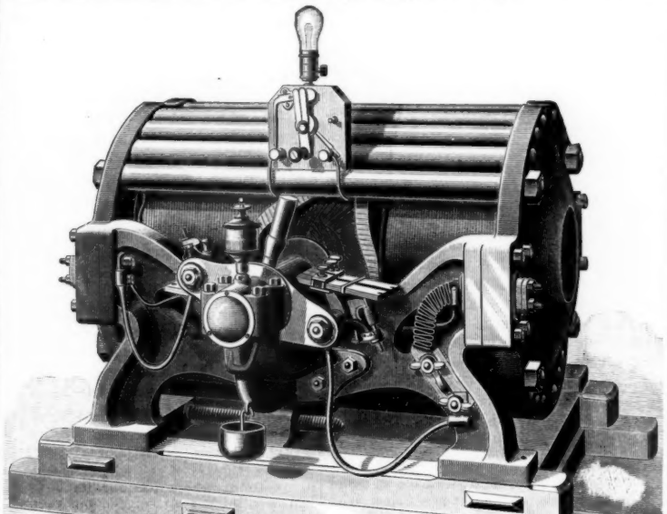
Mr. Hine: Mr. Hebard is entirely right in the matter.

Prof. Marks: Inspector McDevitt, of the Insurance Patrol, Philadelphia, called on me three or four nights before I got a notification from the coroner that I would get a dollar a day if I came, or be fined five hundred dollars if I did not come, and told me his plan with regard to experiments. One thing that bothered him was his safety plug. For instance, he gets a three-light safety plug and he sticks on ten lights and the plug holds. He was talking about this matter, and I suggested to him that he take a file and file the safety plug down till it felt warm to the finger. Mr. McDevitt did it. I wish you could know Mr. McDevitt. He is a natural born fire inspector. I think if you go to Philadelphia you will find Mr. McDevitt will be one of the least troublesome men that you could have any dealings with. I know that he feels that electric lighting is safer than gas lighting.

Mr. De Camp, of Philadelphia: I think the time will soon come, if not already here, when there will be no antagonism between the insurance and electric light interests. There is no individual risk held by the insurance companies in comparison with the risks of the electric light light companies Fire risks are generally limited to policies of five or ten thousand dollars, which is a mere bagatelle compared with the injury an electric light company would receive as the consequence of a fire.

Mr. De Camp spoke at some length, complimenting the work of Inspector Mc Devitt.

Captain H. R. Gardner, of the Consolidated Electric Light Company: I trust you will pardon a layman for intruding a remark in the midst of a scientific discussion, and a lawyer is the worst sort of layman when he gets into a crowd like this. I cannot, after hearing what has been said, see any objection to the regulations which the respective Boards of Fire Underwriters require the electric light companies to follow. I think a matter which more seriously calls for amendment is defective installation. This, it seems to me, might be remedied by proper inspection during the progress of the installation; first, by having the proper man at the head of the installation; second, by having proper linemen to do the work, and



Incandescent Dynamo of Thomson-Houston Co. (See Page 8.)

third, by having competent men to manage the plant after the installation is made. Nothing is more important than the proper education of the linemen. The appellation "wire-worker" has become associated with the devious ways of life. The "boodle" alderman would not have been so unsuccessful had not his early education been neglected. The successful politician is a successful wire-puller. Therefore, why should we not educate the men who are engaged in wire work to do that work properly? (Laughter.) When the electric light companies realize that it is their duty to educate men to do this work thoroughly and hold them responsible for every defect, you will hear no complaints from underwriters in my opinion. (Applause.)

Mr. F. A. Gilbert, president of the Boston Electric Lighting Company, was called for and said: I do not know how it is through other parts of the United States, but the New England Board of Underwriters have an inspector whose territory is all New England, excepting Boston. There we have our inspectors under the Boston underwriters I have no criticisms to offer in regard to those inspectors. I think they are fitted to the place. But it seems to me that this club, or the Electric Light Association, is the body that should have something to say in deciding who is a competent man to act as an inspector for the insurance companies. At the time I took hold of the Boston plant, I found that they were paying a large price to the Boston Insurance Exchange for inspection. At first we looked upon it as blackmail. But after talking the matter over with members of the exchange, we were led to believe that they were partly right, and we thought that it was best that they should have an inspector, and pay so much to the exchange, which we do. I think the convention should appoint a committee who shall be the judges of the competency of persons to fill the position of inspector. I do not think the insurance companies have had enough experience to select men who are competent to be inspectors, in all cases. I think a competent inspector would be as good a teacher as we would want for our workmen, aside from the orders given by the different superintendents.

Gen. C. H. Barney, of the Sawyer-Man Electric Light Company: Following out the idea suggested by Mr. Hine's paper, I would respectfully offer the following resolution:

Whereas, There is a lack of uniformity in the application of the rules of the insurance interest governing the installation of electric light plants throughout the United States, and

Whereas, These rules are in the main comprehensive and satisfactory, the only objection being the matter of detail and thorough understanding of their proper application; therefore be it

Resolved, That the President of this Club appoint a committee of five, including the President, to confer with the committee that may be appointed by the National Electric Light Association, to consider the question of uniform rules and regulations to govern the installation of electric light plants; that these committees be requested to confer with the representative underwriters, and that they be solicited to take measures authorizing the appointment of a committee for the consideration of this matter with the committees above named, and that a report will be expected from this committee at the next regular meeting of the club, March 3d.

The resolutions were adopted.

The Chair appointed as the committee, Mr. Geoge W. Hebard, President of the United States Electric Lighting Company; Mr. Geo. W. Stockley, President of the Brush Company; Mr. T. A. Edison, of the Edison Company; and Mr. N. T. Pulsifer, of the Mather Electric Company, and in accordance with resolution, the president is also a member of the committee.

Mr. Hebard: I want to refer to a point which I did not make clear when I spoke before—the fact that when you compare the electric light with any other means of artificial illumination, it is infinitely safer. While an electric circuit improperly erected may set fire to combustible materials near it, under given conditions, the conditions which produce fire are easily avoided. But even if an electric current should set fire to these combustible materials, the electric current contributes nothing towards continuing the fire, while gas, oil, candles and other means of artificial illumination not only set fire but feed fire. With regard to underwriters, we must remember that this question of rules and the selection of inspectors are matters that belong solely to the underwriters. We make such suggestions to them as we please, but we have no control in the matter. If we wish to influence them we must lead them to see for themselves rather than seek to coerce them into a position which we may know to be better for them and for us, from our point of view. I am sure that as a class the underwriters are honestly seeking, in the midst of pressing duties in other directions, to know what they may of this new business, which, after a little time, will become as familiar to them as gas lighting or any other means of artificial illumination.

Mr. Geo. M. Phelps, Jr.: A fact that is noteworthy in connection with the present discussion is that the application of sound engineering principles to the construction of electric light conductors has not been fully attended to in this country. A Western operator said years ago, that if there was a break in the line you could put on more battery and jump the break. One of the results of the verdict spoken of, will be, I think, an incentive to electric men to see that they apply sound and well known and simple principles in the same manner that engineers of bridges, of steamships, of aqueducts, apply similar principles in their work. In the carrying out of electric lighting, precautions which are in the knowledge of every constructor have not been carefully attended to.

Mr. Henry Hine: It seems to me that the question of the safety of the electric light has been so well established that it would be more to the point to discuss whether or not it is important to obtain uniformity in rules. I do not think that any of the electric light men claim that the present rules are outrageous or not well adapted for their purpose. But there is considerable inconvenience due to the fact that these rules are not uniform. It seems to me that that is the most important point in question

The discussion closed at this point.

THE MENU.

The following is the *menu*, a copy of which every one present carried away with him:

OYSTERS.
Blue Points—Half Shell.
An' thou did'st not head the list,
Half-shell dainty—thoud'st be missed!
Thou art here—sing "Benedicite,"
Austere Sons of Electricity!

SOUP.
Colbert
(Eaten with 14-hour carbons for chopsticks.)
Cel—ery Anchovies Olives
(Daniell's.) (Sight feed lubricated.) (Per-oxydized.)
Palma Pina Sherry—E. M. F., 2,600 volts.

FISH.
Filet of Halibut (caught with lines of force), sauce Bearnaise, Parisian Potatoes.

ENTREES.
Filet of Beef, Macedoine
Mashed Potatoes au gratin Green Peas
(Double pole safety strips should here be inserted to guard against overloading.)

ROAST.
Breast of Philadelphia Capon with 10 ampere currant jelly.
"Ruinart" and "Morizet,"
Here their little part will play,
And generate immeasurable force;
One coulomb put down internally
Would pulsate most infernally,
Inducing currents strong of deep remorse!

SALADS.
Celery Fotticus
(Grounded on one end.) (Field circuit.)

DESSERT.
Chocolate and Vanilla Souffles
(a la Leclanché.)

CHEESE.
English Brie American
50 C. P. 2,000 C. P. 16 C. P.
"Comparisons," like cheese, "are odorous."
—Shakespeare, Much Ado.

FRUIT.
Grapes Pears Bananas
(Connected in parallel.) (Arc.) (Waterproof Insulated.)

COFFEE.
(Saturated solution.)

THEME.

Heavy damage wrought by fire,
Supposititous cause—a wire.
Same cause spreads the news like lightning through the land;
When 'tis later ascertained
That some drunkard—addle-brained,
Blew out gas, or knocked a lamp down with his hand.
Won't the gentlemen of Insurance,
Realizing the endurance
Of our system—search—investigate,
And adopt the wise conclusion,
That our interests lie in "fusion,"
And grant a well-deserved and lower rate.

Ohm, Sweet Ohm!—We're G'wine Ohm to Dy-na-mo.

The following announcement also appeared on the *menu:* "Next regular meeting, March 3d, 1887, at which time a paper on 'Electric Motors' will be read by Mr. Stephen D. Field."

ELECTRICAL REVIEW

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Frank M. Gilley, 54 Equitable Building, Boston, Mass., is our New England representative.
Mr. C. C Haskins, 198 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West
Messrs. Wm Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, FEBRUARY 12. 1887.

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In the widely-advertised case of the United States *vs.* The American Bell Telephone Company, service has been made upon Wm. R. Driver, at Boston, the treasurer of the company, and upon Chas. E. Hubbard, clerk. The return also states that the defendant, Alexander G. Bell, could not be found within the district. Appearance for the defendant was entered by J. J. Storrow and George L. Roberts.

The decision in the great telephone suit is awaited with considerable interest. It looks favorable for the Bell interests at the time we write this.

The gas works exploded in Lynn, Mass., and left that city in darkness. If the electric light had been used there would have been no explosion.

A company of Italian capitalists has undertaken to light Rome by electricity under a new system. The plant of the company will be operated by water power furnished by turbine wheels in the Tivoli waterfalls.

This is our last opportunity before the convention to urge all our electric lighting friends to attened the National Electric Light Association meeting in Philadelphia next week. The sessions begin Tuesday noon at the Hotel Lafayette, and will probably continue three days.

The Electric Lines Company, of New York, asked for a writ of peremptory mandamus to compel the Commissioner of Public Works to grant the company permission to tear open the streets for burying wires. The Court of Common Pleas affirmed the order denying the motion, and the United Lines Company's plan of burying its wires is effectually stopped.

The Indianapolis *Sentinel* rises to the situation in that State as follows: "Whatever may have been the opinion when the present telephone law was passed, experience has made it very evident that its practical workings are not good. The present system and service in Indianapolis and the larger cities of the State are not satisfactory; and many parts of the State want telephonic service that are never likely to get it under such a law. The act ought to be repealed."

Electricity has, in its time, played many parts, but to apply it to a conductor's baton has, at any rate, the superior merit of novelty. After the recent manœuvers of the German army, a serenade was given in honor of the Emperor, and 1,200 executants took part. It was pitch dark, and, of course, quite impossible for the bandsmen to see the conductor's beat. But science suggested an accumulator on the music desk, connected with a properly covered wire secured along the conductor's stick, from the tip of which there shone a tiny electric light.

People gradually grow sensible on this telephone question. As the day of settlement approaches, the reasons why, or why not, seem to clear up of their own accord, and the general public is getting rid of that ophthalmic condition which has been so contagious, and even Syracuse and its Mr. Meyers has accepted the situation. The Rochester people had better follow his footsteps, and the Evansville folks take the same sensible view of the case, and accept the inevitable.

The Secretary of the Treasury has submitted to the House, and asked for action, an itemized estimate of the expense of providing a permanent lighting plant for the Statue of Liberty. The estimates aggregate $32,500. The Board recommends the erection of a separate building to contain the machinery and coal, and proposes to improve the present lighting system by increasing the side lights from five to thirteen; by placing a lens in the flame of the torch, with a group of lamps arranged in a cluster, to be run by an independent dynamo, and by lighting the interior of the statue and pedestal, engine and boiler room, etc., with incandescent lamps. A separate wharf for landing stores is also required. The lighted torch has been burning brightly for several weeks, and Congress should provide abundantly for its continuance.

We are informed by the letter of a correspondent, given in another column, that the buildings of Bowdoin College are soon to be lighted by electricity. It is to be wondered that Harvard College has not moved in the same direction. The project has been often suggested in the college paper, but the corporation does not care or has not sufficient means to carry out the enterprise. The income from the rental of lights to students would alone pay a handsome dividend on the cost of the plant. It is suggested that of the large amount left by will to Harvard, a portion be given for the express purpose of purchasing an electric light plant. Until that time the yard could be lighted by arc light. In the engine room of the Jefferson Physical Laboratory there is a 20 horse power engine and doubtless one of the more enterprising companies would lend a machine and lamps for a short time to the college.

There is a growing interest in the storage battery branch of electrical work. There are a number of enterprising factors in this work, prominent being the Electrical Accumulator Company (mention of which is made on page 8), the Brush Company, the Julien and others. It is worthy of mention that the company first named has given strong evidence of its faith in the value of its possessions by the construction of an extensive factory, with a capacity of 1,000 accumulators per week, and is at the present time turning out one-half that number; and, also, that the telephonic world has been so largely drawn upon in the organization of the company's staff, which comprises, among others, Messrs. T. N. Vail, O. E. Madden, E. J. Hall, Jr., Chas. Truex and W. B. Vansize.

The Grand Jury of Brooklyn is of the opinion that something is wrong with the several electrical contracts of that city, and launches forth a number of insinuations, and calls on the Legislature to investigate. The telephone company is mentioned as having combined with the city's fire department to aid in advancing its work. We would like to go on record right here with the prediction that the most searching investigation will never find the slightest taint of fraudulent work on the part of the telephone company in question, which has for its head such widely known and conspicuously upright gentlemen as President C. F. Cutler and General Manager W. D. Sargent.

The American Company has just decided upon the organization of a foreign department of its business, and a company is now under organization which will control its entire foreign business. Installations are to be made in the different leading cities of Europe, Japan, Australia, Mexico, and South America. These installations will be under the supervision of experts of the American Company and manufacturers of competitive apparatus doing business in the respective countries will be challenged to a competitive test.

LET US HAVE MORE ELECTRICITY IN OUR SCHOOLS.

It is now becoming unfashionable to criticise, even in a friendly way, our school system. If one is on a board of education, remarks concerning the inefficiency of any department of instruction are in order; but for an outsider to question the propriety of any system of instruction, makes him open to the charge of being antagonistic to the American plan of popular education. Well knowing that our purpose may be misunderstood, we wish to make a few suggestions regarding the study of physics or natural philosophy in high schools and academies. Not many years ago little was known—at least among teachers and school text-book writers—of current electricity and its applications. It is natural, therefore, that the study of so-called frictional electricity had a prominent place. As much was known twenty years ago about the simpler phenomena of frictional electricity as now, yet in the schools the pith ball, Leyden jar, sealing wax and silk, chime of bells, excited wig, etc., occupy valuable time, which, if given to such portions of the subject that are more easily understood, would have a greater educational value, and be more nearly related to domestic and manufacturing uses. An expensive Holtz machine and all the paraphernalia of surface electricity are purchased and the money is about as good as wasted. The teachers of the present day must wake up and learn that electricity is more than a plaything, and that the varied industries in which it is an important aid are so numerous that every person is benefited by a practical knowledge of the subject. Let the instruction be made more practical.

CHICAGO ELECTRICAL NEWS.

Nice little circus that in Louisville, on the night of the 1st instant, when an overhead electric light wire gobbled up every fire alarm box on Main street, and left nearly the entire street, where the heaviest business houses are located, without fire protection. Seven thousand dollars is much money for such a show, and what the amount might have been but for the presence of mind—in this instance better than absence of body—of the chief operator, who threw the big book on to switchboard and cut the affected circuit, while standing on the insulating volume. He who cuts a wire under such circumstances needs be not only prompt, but cautious. More than one case has occurred where the pliers—especially with number six or larger wire—don't let go when the cut is made, and the loose end has flown back, hitting the face, hand or head. The result is instantaneous, even if "we have a man in our shop who can take the current of a 60-lighter and not flinch."

How differently a thing appears when you see it through the spectacles of a newspaper reporter. A recent outburst of this newspaper sort of showing would make a good puzzle for the sphinx department of an electrical paper. The wonder-monger says of the "recent discovery" which is on the telegraphic order: "The invention, as described to me, is like a slate placed upon a man's desk, upon which a message may be written, and by the simple touch of a button transferred to the central office, and thence to destination in an exact fac-simile. Messages can be delivered automatically, without the presence of the persons to whom they are directed."

The American District and the telegraph people in the West have been doing all this for a long time. The message is written on paper, enveloped and sealed. The button is touched; in comes a blue racer. He whisks the whole thing out of sight in a minute, and delivers it, regardless of whether the party addressed is present; and whether he ever will receive it or not, is alike immaterial. There does not seem to be anything new in the invention.

Talking of electric lights throughout the Northwest brings to mind that there is a first-class hotel in a thriving town, away up there, that was wired about three years ago, for both arc and incandescent lights. In those days to say "underwriter's" wire was equivalent to saying, "the very best wire in the market." The incandescent wires are all perfectly useless, and the arc-light circuit is a series of patches. The lines having been all laid in the unfinished walls while construction was going on, they were always grounded, and every now and then a wire burns out. Then an outside clothes line loop is put in round the break, and the thing goes on again. The result, from a visual standpoint, is ludicrous in the extreme. A wire comes from its hiding place, drops into a lamp, goes out the other side to the next lamp, and, leaving that, disappears in the ceiling. It is an odd sight, to be no more severe. The incandescent job, although it costs very large money, was a dead loss from the start—all on account of the underwriter's wire.

The Chicago Edison Electric Fire Extinguisher Company, at Chicago with $300,000 capital, was incorporated here the other day. The incorporators are eminently qualified to become the strongest kind of a firm, and Thomas A. will have to look to his laurels. Of the three, the first is a denitist, the second a physician, and the third a book-keeper.

Talking with a theatrical manager from the Northwest, the recent fire in Philadelphia was alluded to. "Do you know," said he, "that a combination devilry and danger was on at my house, and I was not satisfied to leave it without close watching. The electrical part of it, just when they had told me it was thoroughly safe from every standpoint, went off somehow. I am no electrician, but I put a stop to that feature at once. Prompt told me afterward that if the house had not been thoroughly protected with safety catches he and I would both have been out of a job to-day."

CHICAGO, Feb. 7th, 1887.

BOSTON ELECTRICAL NEWS.

The Boston Electric Lighting Company are fitting the Aldermanic Chamber, Boston City Hall, with Sun Regina 125 candle-power incandescent lamps. The improvement in the Council Chamber due to the use of the same lamps has been much commented upon. The air is pleasant, which before it was damp, and as one member of the Council remarked, "bad enough to give any man a headache."

Mr. H. McL. Harding, who has so successfully managed the New England business of the Sprague Motor Company, has been appointed to the position of general-manager of that company.

Mr. Frank Ridlon begs to correct his statement, made at a recent meeting of the New York Electric Club, regarding the losses by fire from electric lighting paid by the Manufacturers' Mutual Fire Insurance Company; as on talking with Mr. C. J. H. Woodbury, he finds that the company, although insuring almost all the large mills in New England, have never paid a cent for losses from fire due to electric lights.

The railway disaster which occurred recently in Vermont will probably bring before the attention of our Legislature the necessity for action in regard to lighting and heating railway cars. Steam from the engine for heatings and current from dynamos or storage batteries for incandescent lighting could be used with perfect safety from fire.

The Pfaunkuche Electric Light Company, of Rochester, New England, have purchased a 30-light (arc) Brush machine to furnish current for arc lamps and multiple series distributors.

Parties desirous of obtaining a site near the water front have been looking over several available lots. A large station to distribute electric power will be built as soon as a location is decided upon. The most approved form of triple condensing engines will be used, the water for the condenser being pumped from the ocean.

T. Martin & Bro., elastic web manufacturers, will in a few weeks start a 300 16-candle-power Brush-Swan incandescent plant. Not far from their factory is the Low Tile Works, which was the first to adopt the Brush-Swan incandescent light in New England.

BOSTON, MASS., Feb. 9.

Washington spiders have discovered that game is plentiful near the electric lights which illuminate the public buildings. In consequence, their webs are so thick and numerous that portions of the architectural ornamentation are no longer visible, and when torn down by the wind, or when they fall from decay, the refuse gives a dingy and dirty appearance to everything it comes in contact with. Not only this, but these adventurers take possession of the portion of the ceiling of any room which receives the illumination.—*Science.*

In a recent number of the *Engineer* mention is made of the smash-up of an electrical head-lighted locomotive. The dynamo had hoodoed the engineer's watch. This is not a valid reason why electricity is not a proper illuminant for engines. The use of a magnetic shield will protect the watch, and a watch so protected will keep better time in the pocket of an engineer who is running a dynamo than it ever did or will in any other class of service without such protection.

The article says: "No amount of argument could convince an engineer that an electric light in front of his engine would prove anything but a menace to his train in a thunderstorm."

A railroad engineer spends a large portion of his life within a fish pole's length of dozens of electrical wires strung along the line of his road. In every electric light station, great or small, there is an engineer; but this is probably the first instance where engineers are charged as a class with being afraid of a forty-foot electric light circuit in a thunderstorm.

SECONDARY TRANSFORMERS.

BY DR. G. H. BENJAMIN.—*Second Article.*

In the closing paragraph of my previous paper, the statement was made that in all forms of induction apparatus wherein the primary and secondary helices are wound in close relation, and the primary not shielded from the inductive effects of the secondary, must necessarily be more or less loss there—that is to say the re-induction, if I may use such an expression—while adding to the primary current, cuts down the current in the secondary, and the transformation is accompanied by a loss which is evidenced by the heat generated in both circuits.

It appears plain that if a device could be constructed, wherein the inductive effect of the current in the primary on the secondary could be realized without the re-inductive effect of the current in the secondary on the primary, we then would obtain the most economical results.

So far as I am aware, such an apparatus has not yet been made, although inventive talent has been exercised in that direction.

In looking over the many patents relating to induction coils, it is plain that inventors frequently confound conduction with induction. Many seem to have the idea that induction can be prevented or lessened by means of bodies of insulating material. They cannot seem to comprehend that nothing—except a metallic screen, and that not entirely—will cut off induction.

It is curious how prevalent this error is among those having a smattering knowledge of electricity. In order to convince those who still doubt, after an explanation, I have usually asked them to make the following experiment.

Obtain a china plate or sheet of glass, which are the best insulators known—except dry air—and on the plate or sheet lay a fine steel needle. Now take an ordinary magnet and move it under the plate or sheet; the needle will follow the magnet, being inductively influenced. A wire conveying a current will similarly influence the needle. There can be no conduction through the insulator, and hence there must be induction to so affect the needle. The insulator interposed has not the slightest effect in cutting off the induction. It is almost incomprehensible that such ignorance should prevail on the subject. The experiment quoted above is known to almost every school boy, and yet there are hundreds of patents for anti-inductive insulators, conduits and the like, all based on the supposed anti-inductive influence of insulating material, and all absolutely worthless.

Perhaps the fact may be more closely brought home to embryo electricians by referring to the field-magnets of a dynamo, the coils on which are carefully insulated from each other and the iron of the coil, and yet the iron is inductively magnetized. There is one other point which does not seem well understood, viz.: The limit of inductive influence of a current upon a conductor, and whether an alternating currrent exceeds in inductive influence that of a continuous current, the Watt current in each instance being the same. I have previously stated that the limit of field depended upon the Watt current intensity, irrespective of its division into volts and amperes. In Fig. 1

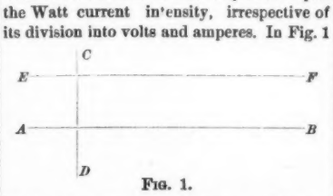

FIG. 1.

let *A B* represent a conductor on which is flowing a continuous current of 60 volts and 600 amperes, represented by the line *C D*, and *E F* a secondary conductor within the field of *C D*. Now, so long as the current on *A B* is steady, no current will be set up in *E F*. Why? Because the lines of force, so to speak, slide along the conductor *E F*.

In Fig. 2 I have indicated the lines of force *C D* as a ring, and the line *E F* is shown threading the ring—just about what happens when the coils on the armature of a dynamo are threading the lines of force in the neutral space between the pole pieces of the machine.

If we vary the current, make it pulsatory, or, what is practically the same thing, alternate the direction of flow of the current, immediately there is a current set up in *E F*.

In Fig. 3 the lines *C D* are shown gradually increasing in length from the point *A*, and represent the rise intensity in an alternation or pulsation, and the oblique dotted lines to *Y* the fall. The line *E F* is cut in both the rise and fall, hence the current therein follows the current in *A B*. Four lines are shown crossing *E F*, and these lines are the

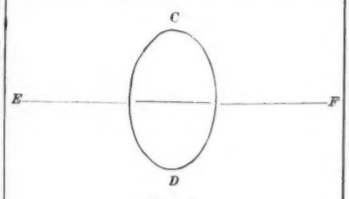

FIG. 2.

effective inductive lines. Supposing now we increase the Watt current on *A B*, or approximate *E F* nearer to *A B*, then more lines will cut *E F* and the secondary current will be increased.

In practice, a wire, as for instance a telephone conductor, may be placed comparatively close to an electric light wire conveying a very heavy but steady current, with but little danger or inconvenience—the pulsation set up by the re-inductive current of the telephone wire being of little moment. The trouble commences immediately there is

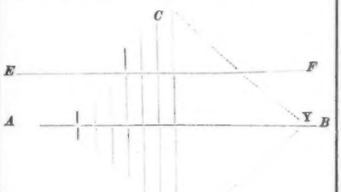

FIG. 3.

a change or pulsation on the line conveying the heavy current, as for instance when lights are switched in or out.

The inductive current set up, often being sufficient to instantly energize the telephone protectors, or in their absence destroy line and instruments.

A current of 600 volts and 60 amperes, so far as I have been able to observe from experiment, has no greater field of influence (distance) than one of 60 volts and 600 amperes.

I do not wish to be understood as saying that the rule is invariable for all limits of E. M. F. Experiment seems to prove that after you reach a certain degree of voltage, or more properly potential, that the current cannot be kept upon a conductor, that is, in the old language of electricity, not bound; it may follow the conductor, or, by reason of the humidity of the atmosphere, lack of pressure in spots, metallic vapor in the atmosphere or the like, suddenly desert the conductor, becoming static and simulating lightning. It is unnecessary to observe that currents of high potential having the vigorous character described, are not play-things to have kicking around the house.

(*To be Continued.*)

Electric Lighting of Bowdoin College.

To the Editor of Electrical Review:

Much pleasure is manifested at the completion of the negotiations with the Brush-Swan Electric Light Company of New England. A central station with a capacity for 50 arc lights and 600 incandescents is to be put into operation at once. Water power will be used. Bowdoin will be the first college in America to be lighted by electricity.

STUDENT.

Bowdoin College, Brunswick, Me., Feb. 5, 1887.

ELECTRIC MOTORS.

AN EMPHATIC CHALLENGE FROM MR. F. J. SPRAGUE.

OFFICE OF SPRAGUE ELECTRIC RAILWAY AND MOTOR CO., 16 AND 18 BROAD ST., NEW YORK, Feb. 7, 1887.

To the Editor of Electrical Review:

SIR: An English paper, the *Telegraphic Journal and Electrical Review*, has seen fit during the last three or four months to make several attacks upon myself. These attacks have not only been made by the editor of the paper, under, it seems, necessarily a gross misapprehension of the facts, but a number of communications have been published, which have been copied by your own and other papers, from Professor Sylvanus Thompson, Messrs. Aryton & Perry, and Mr. William Mordey, in which they, too, have joined the hunt and raised the cry against the originality of my work.

When the numerous duties which occupy my time will permit I will answer, in such detail as I think is necessary, these assaults. Meanwhile I have to make the following proposition, which, if these gentlemen believe what they say, they will either accept, or else apologize for the statements which they have made.

I propose that Mr. Thompson, or Mr. Ayrton, or Mr. Perry, or Mr. Mordey—any one or all of them—and myself, shall build two electric motors, which motors shall be submitted, one to John Hopkinson, of Westminster, London, and the other to Henry Rowland, of Johns Hopkins University, Baltimore, the machines to be duplicates. I mention these gentlemen because they are recognized as men of the highest scientific attainments, and as absolutely beyond and above all question as to their character and the reliability of any test or report which they may make. The conditions for building these motors shall be as follows:

1st. They shall be from working models and designs dating back not less than five (5) years, as sworn to by not less than three (3) witnesses.

2d. There shall be no change whatsoever in the machines from the time the working drawings leave the table until the machines are completed.

3d. Such machines shall be completed within eight (8) weeks from the time they leave the drawing board, or by May 1.

4th. These machines are to be tested, first, for the maximum horse-power for a given weight; and, second, they shall be tested for efficiency with any given weight per horse-power, such weight not to exceed forty (40) pounds.

5th. The motors to be of not less than 10 horse-power capacity for 10 hours' continuous run.

These machines to be given to the gentlemen who make the tests, or to any institute which they may designate, the entire expenses of the tests to be paid for by the competitors in equal proportions.

I shall not now enter into any discussion whatsoever of the question that has been raised by these gentlemen; I wish them to answer explicitly and without equivocation this challenge to build machines on models of 1881, without any change whatsoever from that date to this.

FRANK J. SPRAGUE.

Fully Satisfied.

To the Editor of Electrical Review:

DEAR SIR: A report seems to have been circulated that we are proposing to change our electric lighting system, in consequence of which we are receiving letters from all the numerous electric light companies. As we cannot take the time to reply to all of them, we request that you make public the fact that we do not intend to change from the Western Electric system of lighting, which has been fully satisfactory to us in every way. We are about to increase our plant, and this may have given rise to the report above mentioned.

ALLIANCE GAS LIGHT CO.,
W. W. Cantine, Sec'y.

Telephonic News

*** An Indianapolis business man says: "I think the sooner the Indiana Legislature repeals the $3 a month law, the better her business men will be satisfied."

*** The Rocky Mountain Bell Telephone Company paid dividend No. 13, of $1 per share, on the 15th of January. The Wisconsin paid its usual $2, and the Central Union Company its latter day $1, about the same time.

*** Mr. Brooks, inventor of the Brooks cable, has sued the American Telephone and Telegraph Company, (long distance), on a patent he owns relating to metallic circuits. The company sued does not appear to be much exercised over the matter.

*** The telephone difficulty at Syracuse was settled amicably after four days cessation of the service. General Manager C. A. Nicholson, of the Central New York Telephone Company, has arranged for operating the exchange owned by the American District Telegraph Company, whose Bell license had expired, until the new exchange of his company, with multiple switch-boards, is completed, which will be in about four months. The terms of the agreement give the American company all the profits of the business during that time.

*** The Missouri and Kansas Telephone Company, J. R. Mulvane, President, and C. D. Crandrall, Secretary and Treasurer, send out from Kansas City, Mo., the following notice, under date of January 26th: "At a meeting of Directors held to-day a dividend of one dollar and fifty cents per share was declared on the capital stock of this company, payable on and after February 1st, 1887, out of the earnings of the quarter ending December 31st, 1886. At the annual meeting of the stockholders of this company held to-day, out of the ten thousand shares of stock of said company, there was represented eight thousand three hundred and seventy-nine shares (8,379) all of which voted unanimously to purchase the plant, stock, and all appurtenances of the United Telephone Company, for the sum of $210,769 of the capital stock of the Missouri and Kansas Telephone Company, as per our circular of November 23d, 1886. A special meeting of the stockholders will be held for this purpose February 25th, 1887, at the general office of the company in Kansas City, Mo."

*** While we are liable to be dosed with a surfeit of telephone talk during the trial which is now on, there is a ludicrous as well as a serious side to the question.

Chicago has the glorious honor of claiming no less than three, possibly four, of the original inventors of the telephone. As the back counties have not all been heard from, it is not impossible that some parties in remote parts of the State—former residents there—may yet be unearthed, and be in at the death with their claims.

The last to come on deck up to date is one who invented an "instrument for the purpose of converting an interrupted current of electricity into a continuous sound. In 1871 he made a pencil memorandum in his book of a sketch for a mechanism with modifications designed as a speaking telephone. Early in 1874 he turned his attention to the subject of a transmitter of articulate sounds, and in the latter part of May, 1875, constructed a transmitting and receiving telephone, over which tunes, when sung, could be distinctly recognized, but not words. In June, 1875, he began the construction of another set of instruments and tunes, and entire sentences could now be understood over the instrument. Between the fall of 1875 and April 10, 1876, when he filed his application for a patent for a 'teleloge,' he constructed no less than fifteen different instruments." So ys one of the leading papers there.

Telephone Strikers Give In.

Last Monday thirty-nine out of the eighty-one telephone subscribers in Windsor, Canada, refused to use their phones because the company made a charge of $15 additional for communication with Detroit. The strikers claimed that $25 a year for residence and $40 for business places were quite enough to pay. Two days ago twenty-five of the kickers gave in to the company, and last night there were only fourteen disconnected telephones in Windsor.

Franklin Institute.

ANNUAL MEETING AND ELECTION OF OFFICERS.

The annual meeting of the Franklin Institute was held last week at the Institute Building, Philadelphia. Col. Charles H. Banes presided and submitted the Board of Managers' report for the year. It was shown that at the close of 1886 the total membership was 2,252. The receipts from all sources during the year, including a balance of $810.78, were $31,017.92, and the total expenditures $30,916.97, leaving a balance of $1,100.95. The library was increased during the year by an addition of 1,325 bound volumes, 512 unbound volumes, 96 maps and charts and 1,817 pamphlets—making a total of 3,754 titles, and a grand total of 31,752 volumes.

During the past year the drawing school has been attended by 372 scholars, an increase of 39 over the previous year. The report further stated that as it had been deemed advisable to hold another exhibition, a committee was appointed to sell the building, fixtures and materials, and after paying all expenses to apply the residue towards any financial deficiency. The statement showed a loss of $6,848.27 incurred by the last exhibition. An assessment was made upon the subscribers to the Guarantee Fund, but an unpaid balance of $1,717.78 still remains.

An election for officers resulted in the choice of the following: President, Joseph M. Wilson; vice-president, Charles Bullock; secretary, William H. Wahl; treasurer, Samuel Sartain; managers, Charles H. Banes, Cyprien Chabot, Washington Jones, Isaac Norris, Jr., Alexander E. Outerbridge, Theodore D. Rand, Coleman Sellers, Edward Longstreth; auditor, William B. Cooper.

Secretary W. H. Wahl, in his annual review of the progress of engineering and technology, said: "The year 1886 was characterized by the continuance of the favorable conditions which were well defined at the close of 1885. The industrial revival is reflected in the most satisfactory manner in the iron business. Our iron ore production in 1886 amounted to 10,000 000 tons, and we imported about 1,000,000 tons. In 1885 this country built 3,131 miles of railroad, while in 1886 over 7,000 miles were constructed. During the year this country completely outstripped Great Britain in the production of Bessemer steel; and, assuming the same ratio of increase to be maintained, at the close of this year the United States will have taken the lead as a producer of pig iron.

The production of coal has increased in accordance with the growth of our iron and manufacturing industries. Dr. Wahl said that substantial advances were made in many of the practical applications of electricity. He also called attention to the practical introduction of the "mitis" process of producing wrought iron and steel castings. Fluorine has at last been obtained in its elemental state by a French chemist, who separated it from its combination with hydrogen by the electrolytic method.

The report on the introduction of gaseous fuel was commented upon at some length, and stated that: "Far sighted men are already discussing the feasibility of converting the existing coal gas works into fuel gas works, thus utilizing the existing mains and distributing pipes, and by the simultaneous introduction of the incandescent system of electric lighting, expect a twofold revolution."

The Telephone Girl.

"Well," said Mr. Roland Wayne, when he came into his office, after several days' illness with a wretched neuralgia, which affected him whenever the east wind blew, "you got some one for the telephone—did you, Burns?"

"Yes, sir," the head clerk replied. "The young lady has been here since Tuesday."

"Young lady!" exclaimed Mr. Wayne, testily. "Why do you get a woman? A broker's office is no place for a woman."

"Why, you see, sir," said Burns, with an obvious embarrassment and apprehensive glances toward a light oak partition, behind which the new operator sat in concealment, "you didn't say anything about that—only that Mr. Richards had his hands full with the wires, and that there'd have to be some one to take charge of the telephone; so I—"

"That is just like you, Burns," said Mr. Wayne, stamping back into his private office. "Any one else would have known better."

"Why, you see, sir," said Burns, defensively, as he followed him back, "I didn't think it would make much difference. The young lady is very capable, and she seemed to want the place so badly. She is very poor, sir, and supports her mother. I know something about her, you see."

"Oh! Some flame of yours, I suppose, Burns? Very nice arrangement, for you, no doubt."

"I beg pardon, sir," said Burns, in an offended manner. "I am a married man."

"By Jove! so you are!" said Roland Wayne, with a laugh. "I had forgotten that. Though," he added humorously, "that doesn't always make a difference. Well, try her anyhow. Where's the mail please?"

"I tell you what, Burns," one of the other clerks observed, when that individual finally emerged from Mr. Wayne's office, "the boss is in a fly humor, isn't he?"

"He's all right," Burns answered, warmly. "He has given me a ticket to Atlantic City, and two days off."

The clerk whistled.

"Why, I thought he was going to take your head off."

"You don't know him. I am sure it is no shame to a man whose nerves are always twinging with neuralgia if he loses his temper now and then."

Roland, meanwhile, had taken up his pen, and was writing a lengthy account of Brisket's new deal in P. Y. & M.:

"If the cat jumps this way," he said, in conclusion, "the bears have got him sure. Danbury is on our side. He has given Brisket the cold shoulder, and, if I'm not mistaken, somebody will get wofully left. I don't intend that it shall be me. If everything goes as I think it will, I shall pocket two hundred thousand dollars, and then I am going to get out of the brokerage business. It does't suit me, and my health is so poor that I must get away somewhere, or I shall go to pieces."

"I beg pardon, sir!" said a soft, tremulous voice at his elbow. "I am Miss Archer, Mr. Wayne."

Roland dropped his pen, and rose politely as he saw a slight, graceful figure in black standing before him.

"Be seated, Miss Archer," he said with a smile which no man could have withheld when he saw the fairness of her young face, and that shy, sweet flush on her cheeks. "What can I do for you?"

"I am the telephone operator," she began, rapidly, and with a nervousness she could not conceal. "I—I could not help hearing what you said to Mr. Burns a little while ago, and—and I came to say that if you are not satisfied to have me stay in the office, you need only say so."

"Not satisfied!" Roland echoed, in manifest confusion. "Well, really, you know I have not given you a trial; and as to what I said a little while ago, I am sorry, Miss Archer. I am afraid you will have to set it down to neuralgia. I am quite willing to have you stay, if you will."

"You are very kind," she said, lacing and unlacing her fingers in some confusion. "I should like to stay—indeed it is very important that I should have this position, or something else. But if what you say is true—if a broker's office is no place for a woman—I—I think I would rather not stay."

How Roland Wayne abused himself when he thought of his careless words, and then marked how her lips quivered, how her eyelids drooped to keep back the unshed tears!

"I think I spoke too hastily, Miss Archer," he said. "A lady's place is where she makes it. We are not a lot of savages" he added, with a warm smile. "If you remain here, I think I can insure you courteous and considerate treatment on the part of every one in this office. If such is not accorded you, you have only to inform me, and I will know the reason why."

"You are very kind," said Miss Archer, with a bright, fleeting smile. "I should like to stay. I really cannot afford to resign my position."

"Then stay, by all means," said Roland

And, to the edification of his clerks, he got up and opened the door for her when she went out.

After that, he often caught himself listening to the soft yet distinct voice in the other room, holding conversations over the 'phone.

When he was at home with one of his attacks of neuralgia, and had to communicate with the office by wire, he often remarked how well he could hear Miss Archer's voice, when all the others ebbed away into a Babel of sound.

"Burns did a fine thing when he got that girl in the office," he mused, one day, when he was kept a prisoner very inopportunely. "I don't know what we'd do without her—now especially. Its bad enough as it is. I couldn't have had this attack at a worse time. But I guess everything is all right. Danbury's good for any amount this side of a million. By Jove, though, it would be rough on me if anything went wrong now! It would clean me out completely."

He was walking up and down the room, trying to repress the nervous agitation which attacked him.

"Seven o'clock!" he said, glancing at the time. "The office is closed long ago. In another hour Brisket will sign over those bonds, and then—Hello! what's that?"

The shrill alarm of the telephone summoned him across the room.

"There is no one at the office," he thought, taking up the receiver. "I wonder what's up now? Hello! Wayne! Who are you?"

"It is Helen Archer, Mr. Wayne," said a voice which he knew quite well.

"Why, what are you doing in the office at this time of night?" he exclaimed involuntarily.

"I am not at the office—that is, not at your office. I am at the Central Station. Can you hear me?"

"Yes."

"I have something important to tell you. Our wire got crossed with Mr. Brisket's to-day, and I could hear every word said over it. I could not understand what they were talking about, only Mr. Brisket was talking to a man named Danbury."

"Danbury!" exclaimed Wayne, in great excitement.

"They were talking about bonds, and said a lot of things I couldn't comprehend; but at last your name was mentioned. 'This will put Wayne in a hole.' Mr. Brisket said. 'Yes,' said Mr. Danbury, 'it'll bury him alive. It is a good thing he's shelved to-night. There is no danger, I suppose, of his getting wind of this before 8 o'clock?' 'No danger at all,' said Brisket, 'if you don't go back on me. There will be a new deal all around and we'll boost the market over Wayne's head.' Do you hear what I say?" she interrupted.

"Yes, yes!" Wayne said, excitedly, "What else?"

"Nothing more that I could understand, except that they were to meet as the Continental Hotel to-night at 8 o'clock. I came here because I was afraid to talk from the office. I thought some one might get on to our wire, and I have you here direct. That's all. Good-by!"

For Roland Wayne to dress and leave the house was a matter of very short while after

he had received this message from Helen Archer. His illness and the danger of exposure were quite forgotten.

He was present, very unexpectedly, to Mr. Brisket and Mr. Danbury, at the evening conference at the hotel.

It was a stormy scene that ensued between Roland Wayne and these two men who had combined against him—a scene from which the young broker issued pale with exhaustion, but still triumphant.

What had passed no one knew, but the next day the street was electrified by the news that Wayne was closing up his affairs to go abroad.

"That will throw us all out," said Burns, gloomily; and Helen Archer heard the news with a sinking heart.

She was late that night in going home, having some small errands to attend to on her way; and, moreover, her steps lagged with the consciousness that she had bad news to carry to her poor, ailing mother.

"You are late, Nelly," Mrs. Archer said, as she came in. "This gentleman has been waiting to see you for some time."

It was Roland Wayne, who rose and held out his hand warmly.

"Miss Archer," he said, "I have come to thank you for the service you did me last night. Thanks to you I have saved my fortune from ruin most absolute. If it had not been for your foresight and prompt action, I should have been a beggar to-day."

"I—I had no idea it was so serious as that," Helen said, hastily. "I am very glad I could do you such a service."

"I shall never forget it," Roland said, with a steadfast look into her soft gray eyes. "And I have learned a wholesome lesson. When I went into the brokerage business, I did not dream that so much of my intercourse would be with men wholly devoid of conscience or principle. I am sick and disgusted. Last night I had expected to make two hundred thousand dollars by one transaction. To-day I find myself thanking heaven, and you, that I got out without losing anything. I am tired of such chances. I do not feel that I can enter into contracts with men like Brisket and Danbury without compromising myself; and so I have decided to get out altogether."

"I understood that you were going out of business," said Helen, quietly.

"Yes, I am. I shall close up the office as soon as possible."

"I expected that; and—and I don't wish to trouble you, Mr. Wayne, but if you see an opening for me anywhere, would you be so kind as to recommend me?"

"I have just been talking to your mother," said Roland, bowing to Mrs. Archer. "I am going abroad My health requires it; but I do not like the idea of going alone. I want you and your mother to accompany me. It will do you both good—indeed, you need it as much as I—and I won't take a refusal."

This is how Helen Archer took her first trip to Europe.

When she came home, Roland Wayne had given her a situation—as his wife.

The Working of Telephone Wires Underground.

To the Editor of Electrical Review:

DEAR SIR:—In the report of Professor Plympton on "Telephone and Telegraph Systems in European Cities," published in the REVIEW of January 29th, the Professor states that he conversed by telephone through a circuit of twelve and a half miles of underground wire, connected with thirty eight miles of overhead line, and that the result was satisfactory.

If the Professor will kindly give your readers more data on this experiment, it will add still more value to the interesting report. I think I am correct in saying, experiments in this country with our ordinary instruments and conditions will not give so satisfactory results as were experienced in this case.

Can the mileage "static capacity" of those underground wires be given? If not, the size of wire and distance between each wire and its nearest adjoining conductor?

Was the conversation through central office apparatus—especially annunciator or bell magnets and what resistance?

What was the transmitter used, and how much local battery?

Induction coil or was transmitter and battery connected in main circuit?

I understand the report was not made for special interest of telephone people, but since it is printed in your paper these additional facts, if easily obtainable, will be welcomed by many readers. Respectfully,

I. H. FARNHAM,
Electrician New England Telephone and Telegraph Company.
Boston, Jan. 31, 1887.

A Report of Last Year's Work of the New York Subway Commissioners.

The Subway Commissioners last Friday considered the report of the Board which was submitted by Mr. Gibbens, who had been appointed a committee of one to prepare it. It was adopted substantially as presented, and as soon as printed will be forwarded to Governor Hill, Mayor Hewitt, the Controller and the Commissioner of Public Works. Copies will also be sent to members of the Legislature. The document begins with a review of the work done by the Commission during the year, and touches upon the difficulties encountered in carrying out its plans, which are explained in full. In reference to the outlook for the coming season the report says:

The Commission has been busily engaged during the fall and winter months in preparing for the construction on a larger scale in other streets of the city, the form and material for which will be adapted to the particular location and service for which they are designed, and with the return of suitable weather it is expected that satisfactory progress will be made in this direction.

The different electric light companies in the city have made application to the Commission for the construction for conduit covering about fifty miles of street, and the telegraph and telephone companies have signified their desire for accommodation of about 20,000 miles of wire.

Then follows a discussion of the legal difficulties with which the Commission has had to contend and which still embarrass it somewhat. On this subject the Commissioners say:

The enforcement of the law relating to electrical conductors in the city of New York has occasioned considerable opposition. The first met with was in the illegal extension and renewal of overhead systems without the consent and approval of the board. Prompt action on the part of the local police authorities, when they were applied to, checked and put an end to this sort of evasion. After a few arrests had been made, and when it was found that the Board was disposed to grant temporary privileges wherever there seemed to be proper occasion, this trouble entirely ceased.

Following this attempts were made by two different companies, organized many years ago for the purpose of operating electrical conductors underground, to construct and operate conduits without the approval of the Board of their plans, and without compliance with the provisions of the law. In most of the litigation attendant upon this opposition, the Board and the local authorities have been successful.

Touching Judge Van Hoesen's recent decision the report says:

The constitutionality of the law regulating the operation of electrical conductors in the city of New York, though several times questioned, has not been denied, and it has always been decided that companies operating electrical conductors desiring or being required to place the same underground must conform to the Act of 1885, and gain the approval of the Board of their plans of construction. In a suit brought by the Board to restrain the New York Underground Telegraph Company from carrying out its publicly expressed intention of making excavations for the purpose of operating electrical conductors underground, until such time as the said company's plan of construction should be submitted to and meet with the approval of the Board, however, one of the learned Judges of the Court of Common Pleas has decided that the Commission is acting without authority of law in constructing through a servant company a general system of subways, that it has no authority to compel the use thereof, and that its attempt to do so is an attempt to create a monopoly.

It would seem to be necessary, therefore, for the Legislature to interpret, in some manner, the Act of 1885, and indicate whether the construction of it rendered by the Attorney-General, and acted upon by the Board, or that of the learned Judge of the Common Pleas is to be followed, if the work of the Commission is to be carried on and completed. It is unnecessary for the Board to discuss the legal questions involved here, as the Commissioners have been wholly guided in this matter by the Attorney-General and their own counsel.

The report then goes on to say that it will be impossible for the work of burying the wires to be completed by November 1, when the Board will expire by limitation, and urges that the Commission be continued until such time as its work can be accomplished. It argues:

A careful estimate of the mileage of the electrical conductors to be provided for, places it at more than three times that of the present overhead systems, or something like 50,000 miles.

It is reasonable to expect that one-third of these will have been provided for by the first of November, 1887. This will leave much still to be done. If the term of office of the Commissioners should be extended for such time as would enable them practically to complete the work intrusted to them, after that the supervision of the electrical conductors and conduits might well be left to the local authorities, or to a single-headed commission, or to such a State Board of Electrical Commissioners as has been proposed; but until the greater part of the work is completed, if the Commission is allowed to expire there will be danger of its not being finished.

The Commissioners deny that they have been extravagant and express regret that the many obligations that they have incurred remain unsatisfied through lack of funds.

None of the employes of the Commission has yet received a penny from the Controller. It is expected that this question will be settled in a short time. The Commissioners received their salaries up to last October. The total expenses of the Commission to date have been $38,671.58, of which $20,431.84 remains unpaid.

The Telephone Trial in Washington.

The hearing of argument continued during last week. On Friday last a sensation was created in the court when Mr. Dickerson, attorney for the Bell interests, pointed out to the court that two years ago, in the Overland case, he prophesied that the time would come when the patent of Royal E. House for a telegraph would be set up as an anticipation of the Bell patent, and that he had put in evidence in the Molecular case, about the same time, the House patent itself, which was now before this court. In that argument in Philadelphia, he said, the woods were full of prior inventors, who would be produced, one at a time, as long as the patent lasted, like Banquo's heirs upon the witch screen. He claimed credit as a prophet, for he said that very thing had come to pass, and the New York *Herald* had many columns of flaming accounts of this wonderful discovery, made within a few days, that the House patent anticipated Bell's invention. Mr. Dickerson then turned to Mr. Lowery, counsel for the Government, and intimated that the Government had set it up in its new bill, filed in Massachusetts, just as he had expected and foretold; while at the same time Mr. Lowery, in this court, as counsel for the other infringers, had assured the court that there was nothing in the House patent, and Mr. Dickerson read from Mr. Lowery's brief the following passage:

Certainly the House phonetic telegraph patents, which were introduced by the complainants themselves, would, in the light of our modern knowledge, undoubtedly, if properly adjusted, transmit speech. Can it be said, however, that the House patents are patents for telephony, or that the long use of the Morse key and sounder are anticipations of the modern telephone?

Mr. Lowery said it was a fair hit, and joined in the laugh which was raised at the expense of the Government suit.

—— The Paterson, N. J., Electric Light Company has engaged three or four hundred incandescent lights, and operations will be commenced at once. They will run the incandescent lights from arc dynamos.

TELEGRAPHIC

.... The Southern Telegraph Company has been sold for $460,000, to a syndicate composed of John S. Wise, James B. Pace, and others, who intend to operate it and run as a separate company from any of the other telegraph companies

.... A machinist of Toledo claims to have discovered perpetual motion. One of three gentlemen (a practical machinist) who were permitted to see his work, says that he really believes the Toledo inventor has a surprise in store for the mechanical world. Full details will be given as soon as a patent is obtained.

.... The Inter-State Telegraph Company of Detroit has been formed, with a capital of $100,000. The stockholders are Richard A. Shipman and Wm. G. Latimer, who hold 970 shares each, and Levi T. Griffin, J. C. Verhoeff and John B. Whelan, twenty shares each, all of Detroit.

....A far West man has outdone one of the original telegraph spellers, who talked about the new way of "communicating dispatches—the 'teletat.'" "Teilophon" and "tebiephon" are two of the latest from "way over there" Daguerreotype was once called "doggeretope," by one whose near relation afterward became a President. You can't most always tell what will happen, or who will do it.

.... It is said that a syndicate composed of New York and Chicago capitalists is about being organized in the former city for the purpose of constructing a new telegraph line between Chicago and New York. The company is to be known as the New York and Chicago Telegraph Company, and its object is to supply brokers and commission merchants in the two cities with private wires. It is proposed to construct in place of the usual single wire a single cable of forty wires. It is contended that once such a line were built the New York and Chicago brokers and commission men could be supplied with private wires at $5,000 per year each, thus yielding a revenue from that source alone of $200,000 a year. When not in use such of the wires as might be needed could be leased to newspapers of the two citise.

Hard Lines.

THE FINANCIAL COMPLICATIONS AT THE BOSTON WESTERN UNION OFFICE.

A great deal of sympathy with Mr. Jairus Harlow, the retired cashier of the Western Union Company at Boston, is expressed by his many friends who are acquainted with the facts in the case. It is said in his behalf that the company has no moral and probably no legal claim now standing against him. Mr. Harlow has within a year or two made good from his own pocket embezzlements by his subordinates amounting to several thousand dollars. The company still claims from him about $2,800, which was stolen by two or three employes in branch offices before the funds came even technically into Mr. Harlow's custody. This claim Mr Harlow resists. His friends also state that he is in no way responsible for the lax business methods of the office; that the amount of work required of him was more than three men could properly do, and his frequent appeals for assistance were denied. It is further stated that such help as he did have was incompetent, and the wages paid the clerks—$8 to $12 per week—are quoted in proof of the assertion. Mr. Harlow's own compensation was $1,600 annually, his responsibility covering the acts of many subordinates and the correct keeping and safe custody of accounts and receipts aggregating more than $500,000 per year. They say that he has for years worked many hours' overtime, and for nine years has enjoyed not a day's rest in his efforts to keep pace with the exhaustive demands which his duties made upon him.

The Electrical Accumulator Company.

EXTENSIVE WORKS IN NEWARK—FIVE HUNDRED BATTERIES TURNED OUT EVERY WEEK—AN ABLE AND ENTHUSIASTIC STAFF ENGAGED IN THIS NEW ELECTRICAL WORK.

There has been constructed in the city of Newark, N. J., within the past nine months an extensive and particularly complete and interesting factory or electrical accumulator works. Nine months ago a vacant block of land was purchased by the Accumulator Company, and within twenty-four hours it was black with laborers. The factory rose rapidly, and was occupied by the company's staff of electrical workers September 1st, 1886, notwithstanding the fact that nearly all classes of labor was engaged in striking during these months of construction, and the experience of the contractors for this work proved to be no exception to that of others.

The energetic head and front of the Accumulator Company, as most of our readers know, is composed of Messrs T. N. Vail, president, and O. E. Madden, vice-president and general manager—gentlemen whose great work in the development of the telephone business of the world is so widely known and recognized that it need not be mentioned here. It was no hasty move. The telephone business had become an assured commercial success, and these two alert and active minds, searching the electrical horizon for fresh fields, became interested in the storage of electricity and its development. Mr. Vail, Mr Frank Madden (brother of the vice-president, and superintendent of the works, having associated with him Mr. F. Reckenzaum), Mr. T. P. Conant and Mr. W. W. Griscom, sailed for Europe some time before the works in Newark were decided on, and thoroughly investigated the business in foreign countries, Messrs. Madden and Conant even serving apprenticeships in the manufacture of the accumulators. What was seen proved convincing, and the factory was begun and completed at a cost of $80,000, and to-day 125 men are employed, and 500 accumulators manufactured every week. In the construction of these twelve tons of pig lead, six tons of oxidized lead and 200 pounds of rubber plugs (used in separating the plates) are consumed each week. The factory is admirably situated for rail and water facilities, is fitted up with many ingenious contrivances for increasing the efficiency and rapidity of the work. A small railway for carrying goods runs through the factory, extending through packing-rooms, forming-rooms, foundry, etc. The power for the works (except in the department devoted to trimming the plates, where there is a small electric motor fed by accumulators) is furnished by a magnificent Watts-Campell Corliss engine of 200 horse-power, and the engine and boiler-rooms are models of neatness.

The office part is 30 by 50 feet, three stories high, the business offices being on the first floor; dining-rooms, parlor elegantly furnished, and draughting-room on the second; and on the third are a number of bed-rooms, and kitchen connected by dumb-waiter with the other floors. The arrangement is most complete, and when the business at the works detain the New York staff they live cosily and comfortably at the factory.

The interior of these works will be illustrated and described in detail in a subsequent issue of the REVIEW.

The history of the storage battery has been made familiar to our readers through the columns of the REVIEW during the past few years. In a very attractive pamphlet just issued by the Accumulator Company, an interesting and succinct review of the history of the storage battery appears. The possibility of the storage of electricity was first suggested by the discovery by Gautherot in 1801 of a reverse current from two plates of the same metal immersed in acid after subjection to the action of an electric current. In 1859 Gaston Planté, while engaged in a series of experiments upon this phenomenon, devised a storage battery, consisting of plates of lead immersed in dilute sulphuric acid, which, from a scientific standpoint, was a success, since when properly manipulated it would yield a high and steady electromotive force and currents of any desired strength, according to the dimensions of the plates; on account, however, of the large surface required to be exposed to chemical action, its great weight, and the fact that months of electrical treatment were required to prepare the plates to receive a charge of any considerable magnitude, the Planté battery was not available for practical use. The theory of the lead battery, as made by Planté, is as follows: When an electric current is passed through the battery the liquid is decomposed, oxygen and hydrogen are set free, the former combining with the positive pole plate producing peroxide of lead, the latter being occluded and held ready for use in the negative pole plate; when the cell is discharged, the oxygen and hydrogen recombine, reforming water. Camille A. Faure, after many experiments in this field, made use of a paste of oxide of lead mechanically applied to the plates, which brought them instantly into the condition to receive a charge, which was only accomplished by Planté after months of electrical treatment; moreover, materially increasing the efficiency and capacity of the battery and reducing its size and weight. Imperfections, chiefly of a mechanical character, existed in Faure's battery which the Accumulator Company believes to have been entirely overcome by the supplementary inventions of Messrs. Swan, Sellon, Volckmar, Shaw, and others, which they own.

The standard type of cell manufactured by this company is known as the "15 A" and is made up of fifteen plates (eight negatives and seven positives, the positives being the smaller to allow for the "growth" or expansion that gradually takes place)

The general appearance of the cell is shown by the illustration, and the details are given on page 9.

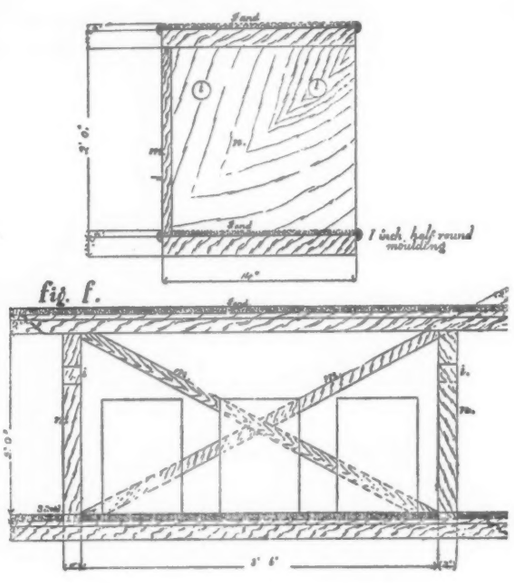

FIG. 2.—SHELVING FOR ACCUMULATORS.
m m Bracing. *n n* Supports. *i i* Holes for connections.

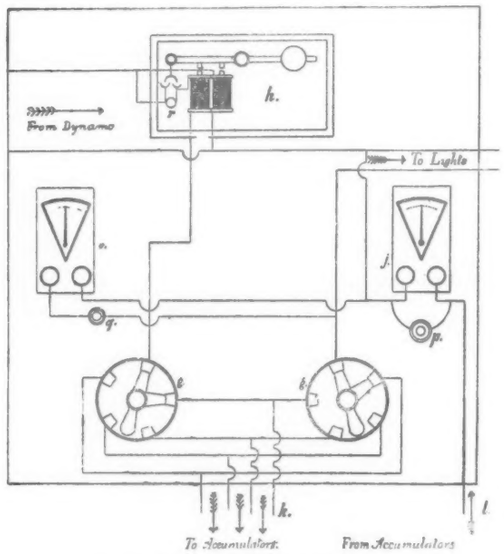

FIG. 1.—SWITCH BOARD OF ACCUMULATOR CO.
h Automatic Switch; *r* Short Circuit Switch; *o* Volt Meter; *q* Switch for Volt Meter; *j* Am-meter; *p* Switch for Am-meter; *g g* Regulating Switches.

The internal resistance claimed for the battery is extremely low, say from .001 to .005 ohm, and the range of current large. The capacity of the battery, it is stated, is somewhat underestimated at 350 ampere hours, 35 amperes, a safe working current, will last for ten hours or more, or a less current would be supplied by the cell for a proportionally greater number of hours. A greater current—up to 300 amperes—can also be obtained, but so great a strain upon this size of cell would rapidly injure the plates. From the data given the number of cells required for any class of electrical work can be determined, when the requirements in volts and amperes and time are known. Adding to the number of cells in multiple arc, increases the number of amperes, but does not increase the electromotive force; on the other hand, adding to the number of cells in series does not increase the number of amperes, but simply increases the electro motive force.

The two branches in the electrical field that these accummulators are particularly adapted for are those of electric lighting, and the furnishing of motive power. In New York city two extensive lighting plants are in operation, one at 44 Broadway, and the other at 80 Broadway. A member of the staff of the ELECTRICAL REVIEW, accompanied by Mr. Madden and Mr. Conant, of the Accumulator Company, visited both these plants, both of which were working to the full satisfaction of the patrons—the light in every instance being steady and strong. At 44 Broadway, a United States Company's dynamo is used for charging the batteries, the lamps being specially constructed 60 volt 16 candle-power lamps of the Edison Company. At 80 Broadway, the storage battery plant has been in use for three years, the new batteries of the Accumulator Company replacing the former ones, the United States dynamo and lamps being used. The works are lighted by the accumulators, charged from Edison and Edco dynamos, the lamps of the former being used. A number of plants have been put in at Philadelphia, and at Havaford College a municipal or village system of lighting from storage batteries will soon be completed.

Exhaustive private tests are being made with this battery for furnishing power and in this branch the company find great interest existing on the part of the public. Applied to street railways they supply light and furnish power, and each car is absolutely independent, in distinction from direct current power.

The company announces that it is prepared to furnish its accumulators for all purposes upon reasonable terms and will guarantee a return of 80 per cent. of the current with which they are charged, and make good any defects which may be found within two years, provided, of course, the accumulators are used in accordance with instructions. Mr. W. W. Griscom is managing electrician of the company.

Prof. Elihu Thomson's Incandescent Dynamo.

In the illustration on page 3 is shown an excellent cut of Prof. Elihu Thomson's new incandescent dynamo. In this machine the design of the field magnets, it will be observed, is similar to that of the arc machine, but while retaining the spherical armature, the three-coil winding of the arc is replaced by a winding similar to that of Siemens, and the commutator, as is usual in such machines, consists of numerous segments. The leading wires from the commutator bars are carried along the shaft into the body of the armature, and outwards to its periphery, the joints to the armature convolutions appearing on the outside near its greatest periphery. The cores of the field magnets are wound only with wire which is placed in shunt, or derived circuit to the external circuit. It will be noticed that there are two coarse wire coils situated between the field magnets, and directly over and around the armature, occupying an inclined position backward to the direction in which the armature rotates. The effect of these coarse wire coils in the first place, since they are traversed by the main current of the machine, which varies with the number of lamps in use, or the load, is that they compound the machine, or cause, by a direct magnetizing action on the armature, the potential of the machine to remain constant under varying loads, and by an adjustment originally made, the potential may increase to a determined percentage under full load. In the second place the effect of the coarse wire coils is due to their inclined position, their plane of position not coinciding with a plane at right angles to the axis of the field magnets, but being displaced backward to the direction of revolution of the armature. The machines, giving from 75 to 150 volts, have been constructed by the Thomson-Houston Company, of Boston, and have shown themselves capable of taking care of the load without any external regulation.

New Electric Light Work in the West.

Central station plants at Topeka, Hutchinson and Abilene, Kansas, have just been completed by the Western Electric Construction Company, of St. Louis (Edison contractors), and are now in successful operation. The station at Topeka has a capacity of 5 000 lights; the one at Abilene, 4,5 0, and at Hutchinson, 1,900 lights. At Topeka the present load is 2,00 0 Edison incandescent lights; Hutchinson, 1,000, and Abilene, 6 or 700 and rapidly increasing demand at each of these three places.

Particular pains have been taken by the Construction Company, both with the poleline, and also with the inside station work; and the parties for whom the work has been done take particular pride in inviting inspection.

Reorganizing the Schuyler Electric Light.

Senator Hyde has presented a resolution to the Legislature incorporating the Schuyler Electric Manufacturing Company. The preamble recites that the Schuyler Electric Light Company is a New York corporation, with its principal office in New York, but that there is a factory and place of business in Hartford. The company finds it advantageous to transfer its business to Connecticut and asks a charter. A plan to effect the transfer and adjust the liabilities has been agreed upon between the company and its creditors, by which the property and assets are to be conveyed and constitute the capital stock of the Schuyler Electric Manufacturing Company, and the stockholders of the Electric Light Company are to receive common stock in the new company to the amount of $150,000, and the creditors are to receive the preferred stock thereof in payment of their claims. The preamble further recites that the capital stock of the Electric Light Company has been reduced from $ 50,000 to $150,000 by surrendering $100,000 to a trustee, to be canceled on the organization of the new company.

The gentlemen named as corporators of the new company are Charles E. Dustin, of Hartford, and Spencer D. Schuyler, C. L. Buckingham, John Byrne and H M. Pierson, of New York, together with the creditors of Schuyler Electric Light. The common stock is fixed at $150,000 with privilege to increase to $500,000. The preferred stock is $350,000. The new company is empowered to accept in payment of its capital stock a transfer and conveyance of the assets and property of the Schuyler Electric Light. The common stock shall be issued to the present stockholders of the Electric Light Company at par, to each the same number of shares as he now holds in the Electric Light, and preferred stock may be issued to the credi ors. This preferred stock is to pay 4 per cent. per annum, and profits of the company in excess of this shall be used in retiring the preferred stock. The common stock shall be entitled to no dividends until the preferred stock is retired.

—— The Sprague Electric Railway and Motor Company are running thirteen elevators in Boston, both freight and passenger. One of the freight elevators is the largest in the city. They also have fifty other motors in operation.

—— The Brush Electric Light Company, New York, are erecting a new station on Elizabeth street, New York, in place of the one recently burned. They are setting ten boilers with the Jarvis patent boiler setting, and Sheffield grate bar. This company was the first electric light company to be formed in the world, and they used the Jarvis boiler setting under three boilers in the 25th street station in 1881.

—— The gas companies are making good headway in the adoption of the American system of electric lighting. A large number of contracts from gas companies are now under consideration by the American Company. The gas companies generally are making a move before the different State Legislatures for an amendment of their charters to introduce electric lighting in connection with their gas plants. The American Company in all cases is using its best endeavors to second this move.

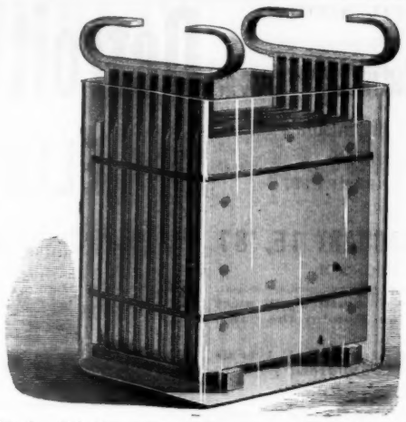

FIG. 3.—15A CELL OF THE ELECTRICAL ACCUMULATOR CO.
Floor space, 8½ × 11 inches; Height, 16½ inches; Weight, 125 pounds; Electromotive force, 2 volts; Current, 35 amperes; Capacity, 350 ampere hours.

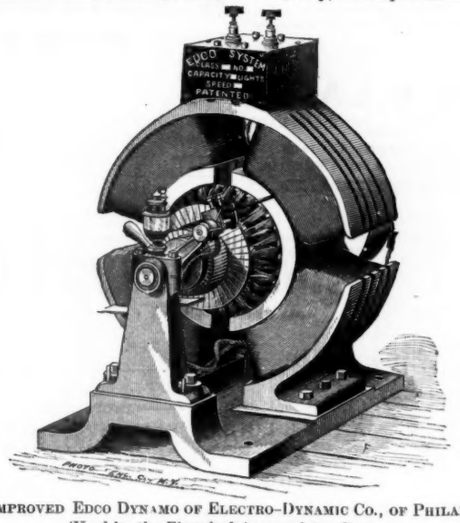

FIG. 5.—IMPROVED EDCO DYNAMO OF ELECTRO-DYNAMIC CO., OF PHILADELPHIA.
(Used by the Electrical Accumulator Co.)

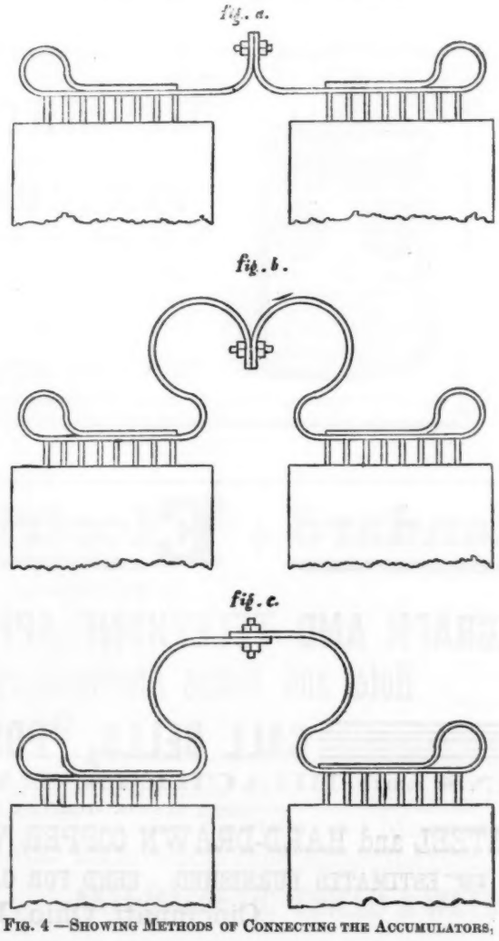

FIG. 4.—SHOWING METHODS OF CONNECTING THE ACCUMULATORS.

ELECTRIC LIGHT NEWS

—— The Western Electric Company, Chicago, have secured contract for lighting new wholesale dry goods building of Lowenstein Bros., Memphis, Tenn., with 90 arc and 100 incandescent lights. Also an order for 180 light plant from Lake Gas Company, town of Lake, Ill.

—— Mr. H. A. Cleverly, of 1018 Chestnut street, Philadelphia, has purchased the interests of his partners and will in future control and manage the Cleverly Electrical Works. Mr. Cleverly is an enterprising gentleman and is doing a fine business in the electrical field.

—— The Wichita Schuyler Electric Light Company has just purchased the land on which their station is built, paying therefor the sum of $6,250; not wishing to increase their building on land which was not their own. On February 1st they were running 215 lamps.

—— James A. Hearn & Son, 24, 26 and 30 West 14th street, New York, have contracted through Mr. T. S. Carman, for 50 arc lights of the Waterhouse Electric Company's system. These lights are to be put in at once and will brilliantly light up this extensive dry goods house.

—— The New York Subway Commission has granted permission to the Harlem Electric Light Company to string four cables on small iron poles 20 feet high and 2½ inches in diameter, not less than 500 feet apart, on Third avenue, and also 125th street between Third and Eighth avenues.

—— A dispatch from London, dated February 1, states that in the action brought by the Edison-Swan electric light interest against the Woodhouse-Rawson interest, for infringement of plaintiff's patents, decision was rendered in favor of the plaintiffs. The defendants will carry the case on appeal to the House of Lords.

—— Prof. Charles W. Eliot, Pres. of Harvard University, in his annual report declares that an electric light plant, large enough for Memorial Hall, Gore Hall, parts of Sever Hall, the gymnasium, the reading room and library in Austin Hall, and the yard, would be beneficial in many ways.

—— The town of Norwalk has just passed a vote authorizing the Street Committee to contract with the Norwalk Schuyler Electric Light Company for 50 lamps. This station was only started September 1st, and had then only 30 lights. Since then it has increased to a capacity of 100 lights, and this new contract from the town will oblige the company to increase the plant by another 45 lighter.

—— The plant for the new electric light company, at Jamestown, N. Y., is nearly completed, and the incandescent lamps in the City Club rooms were tried for the first time last week. The arc lamps in the Broadhead Worsted Mills have been lighted for several days. It will be tried in several of the business places. The Thomson-Houston system is used. There are two dynamos here, one of which will probably be used for the arc lights and the other for the incandescent lights.

—— The American Illuminating Company of Boston is being organized for the purpose of introducing the American system into Boston. The incorporators are Edwards H. Goff, President of the American Electric Manufacturing Company; Col. William A. Stedman, Treasurer of the American Electric Manufacturing Company; Rowland N. Hazard, President of the American Loan and Trust Company of New York, and others. The company is capitalized at $250,000. It is understood that work will be commenced at an early day in putting in a new plant.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING FEB. 1, 1887.

356,786 Alarm for the protection of graves; Willard H. Farnham, Minneapolis, and Chas. B. Askew, St. Paul, Minn.

356,786 and 356,788 Electric arc lamp; Howard L. Pyle, Akron, Ohio.

356,795 Terminal for incandescent lamps; Marmaduke M. M. Slattery, New York, N. Y., assignor, by direct and mesne assignments, to the Sun Electric and Illuminating Company, Manchester, N. H.

356,796 Contact piece for electrical apparatus; Marmaduke M. M. Slattery, Woburn, Mass., assignor to the Sun Electric Light Compay, same place.

356,834 Electric motor; William W. Griscom, Haverford College, Pa.

356,850 Electrical call system; John D. Peachey, Denver, Col.

356,859 Multiple switchboard system of telephone exchanges; Ernest P. Warner, Chicago, Ill., assignor to the Western Electric Company, same place.

356,878 Electric motor; Edwin J. Houston, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut.

356,902 Armature for dynamo-electric machines; Elihu Thomson, New Britain, Ct., assignor to the Thomson-Houston Electric Company, Boston, Mass.

356,903 Electric arc lamp; Elihu Thomson, Lynn, Mass.

356,940 Electrical weighing scale; Willis M. Hunt, Glen Gardner, N. J.

356,963 Circuit-closing apparatus for electric brakes and other devices; 356,964, Method of operating electric brakes; Elias E. Ries, Baltimore, Md., assignor, by direct and mesne assignments, to Edward O. Punchard, Boston, Mass.

356,981 Insulating underground electric conductors: David Brooks, Philadelphia, Pa.

357,038 and 357,039 Autographic telegraph; James H. Robertson, Rutherford, N. J.

357,050 Lightning protector for electrical conductors; Jonathan H. Vail, New York, N. Y.

357,051 Automatic telephone switch; 357,052, telephone signal; 357,053, telephone hook; 357,054, krotophone receiver; Frank C. Watkins, Philadelphia, Pa., assignor, by mesne assignments, to the United States Krotophone Company, New York, N. Y.

357,055 Automatic electric cut-off for water pipes; and 357,056, electrical method of detecting water overflows; Leopold Weil, New York, N. Y.

357,109 Electrical interlocking mechanism for switches and signals. George Westinghouse, Jr., Pittsburgh, Pa.

357,115 Commutator adjuster for dynamo-electric machine; Charles L. Buckingham, New York, N. Y.

357,134 Telephone system; John O. Stockwell, Burlington, Kan.

357,165 Automatic electrical signal coupler; John S. Capers, New Orleans, La.

BUSINESS NOTICE.

Notice is hereby given, that the co-partnership heretofore conducted under the firm-name and title of VALLEE & BRO., at 1210 Market street, has been dissolved by mutual consent, and that a co-partnership between the undersigned has been this day formed under the name and style of VALLEE BROS. & CO., at 932 Arch street, for the purpose of manufacturing and dealing in electrical supplies, and the construction of electrical and pneumatic work of every description. We respectfully ask a continuance of your patronage.

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Your attention is particularly called to our new address, 932 Arch street.

Philadelphia, Jan. 15th, 1887.

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BUSINESS NOTICE.

"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court (7 Beekman St.,) New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World*'s Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend."—*New York Observer.*

THE ANNUAL MEETING
—OF—
The National Electric Light Assoc'n.
WILL BE HELD IN PHILADELPHIA,
—AT THE—
HOTEL LAFAYETTE,
—ON—
TUESDAY, FEBRUARY 15, '87
AT 12 O'CLOCK M.

The Executive Committee will meet at the same place on Monday the 14th, at 3 P. M.

Members requiring Hotel Accommodations will please address,

A. J. DE CAMP,
Chairman Executive Com.,

Stating what is required.

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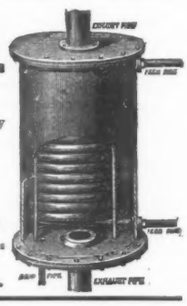
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Fig.259
PHOENIX GLASS COMPANY,
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Fig.255
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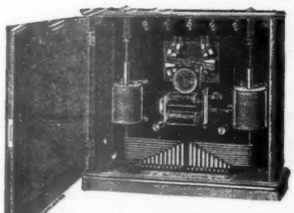

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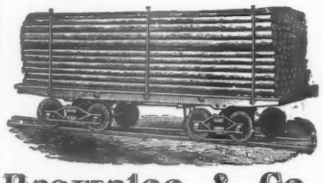

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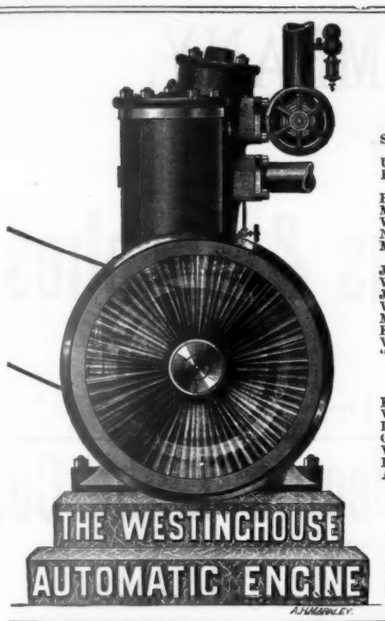

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" "	3d order,	75
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Winona Paper Co.,	4th order,	60
New York & Manhattan R. E Co.,		60
Mather Electric Co.,		60
"	2d order,	60
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J. C. Livingston & Co.,		45
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Miller, Broudy & Co.,		45
E. L McLain Mfg. Co..	2d order,	45
Van Deventer & Horne,		45
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" "	3d order,	35
" "	4th order,	35
" "	5th order,	35
E. Balbach & Son,	14th order,	35
Wolff & Hamaker,		35
Imperial Guano Co.,		35
Chandler & Price,		35
Wabash, St. L. & Pacific R. R.	2d order,	35
Barnes Bros.,		35
A J. Mullen,		35
Pittsburgh, Pa.		150
" "		150
" "		75
" "		75
" "		75
Buffalo, N. Y.		60
Pittsburgh, Pa.		60
Holyoke, Mass.		60
New York.		60
Hartford, Ct.		60
"		60
Jefferson City, Mo.		60
Wahoo, Neb.		60
Little Falls, N. Y,		45
Paterson, N. J.		45
Alexandria, La.		45
Greenfield, O.		45
Plainfield, N. J.,		35
Philadelphia, Pa.		35
"		35
"		35
"		35
"		35
Chambersburg, Pa.		35
Norfolk, Va.		35
Cleveland, O.		35
Ft. Wayne, Ind.		35
Maquoketa, Ia.		35
Selma, Ala.		35
Brainard & Shephard,		25
Henry Warden,		25
Crown Mills,		25
S. R. Cain,		25
Wabash, St. L. & Pacific R. R.	3d order,	25
Minneapolis Gas Light Co.,		25
" " "	2d order,	25
Thos. Henshall,		15
E. Balbach & Son,	15th order,	15
Gas Engine and Power Co.,		15
Roulleaux, Dugaze & Co.,	2d order,	15
Shickle, Harrison & Howard	2d order,	15
McCord, Ford & Co.,		15
Decatur Furnace Co.,		15
Lawrence Machine Shop,	15th order,	10
" "	16th order,	10
N. W. Wait, Son & Co.,		10
F. S. Cole,		10
Union Pacific R. R ,	2d order,	10
Geo. C. Howard,		5
Merritt W. Burwell,		5
Westinghouse Electric Co.,	3d order,	5
Lawrence Machine Shop,	17th order,	5
" "	18th order,	5
J. A. Diamond,		5
F. J. Yandle,		5
Aberdeen Packing Co.,		5
Albany, N. Y.		25
Philadelphia, Pa.		25
Marcellus, N. Y.		25
Bristol, Vt.		25
Ft. Wayne, Ind.		25
Minneapolis, Minn.		25
" "		25
Paterson, N. J.		15
Newark, N. J.		15
New York.		15
Suresnes, Fr.		15
St. Louis, Mo.		15
Colfax, W. T.		15
Decatur, Ala.		15
Lawrence, Mass.		10
" "		10
Sandy Hill, N. Y.		10
Grundy City, Ia.		10
Omaha, Neb.		10
Philadelphia, Pa.		5
New Haven, Ct.		5
Pittsburgh, Pa.		5
Lawrence, Mass.		5
" "		5
Indianapolis, Ind.		5
Santa Rosa, Cal.		5
Astoria, Or,		5
TOTAL, 56 ENGINES,		1975

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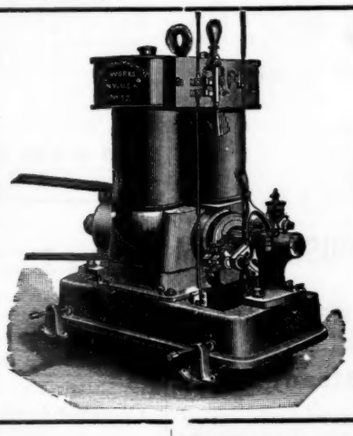

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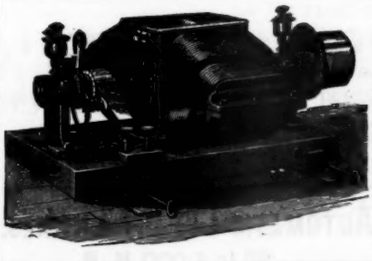

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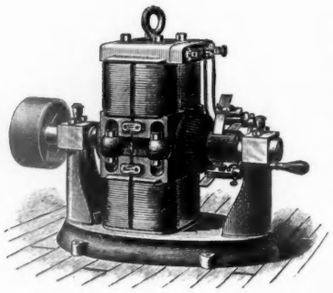

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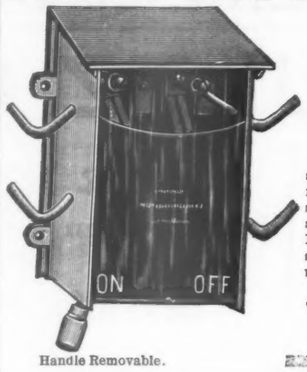

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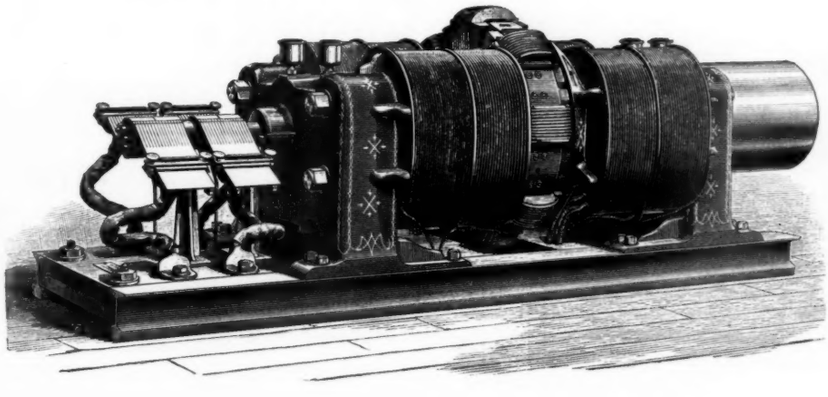

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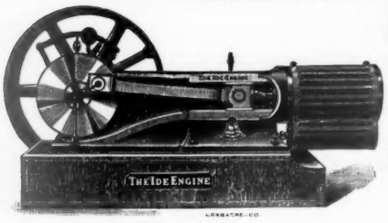

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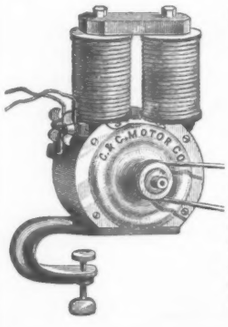

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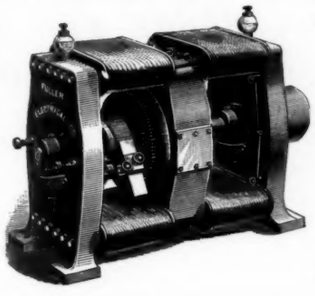

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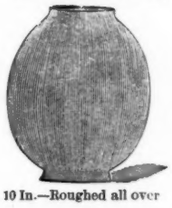
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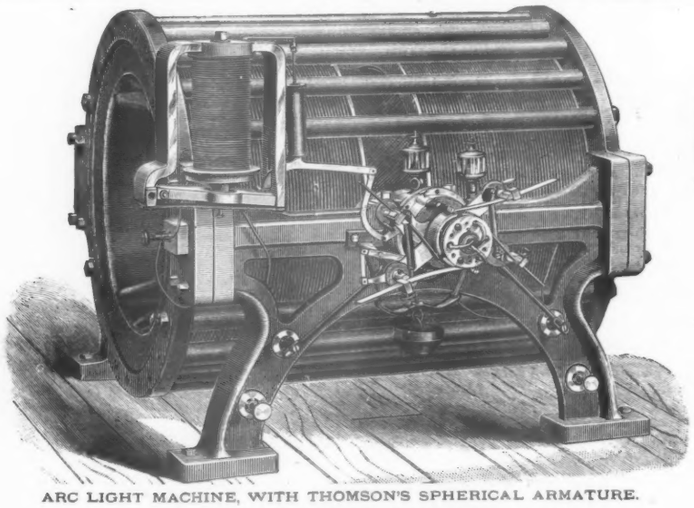

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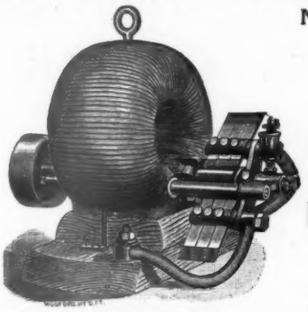

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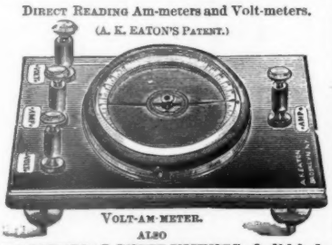

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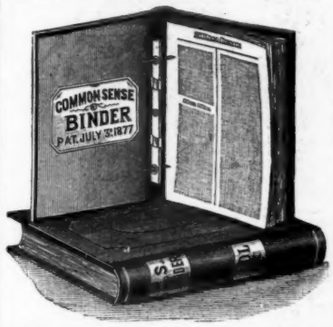

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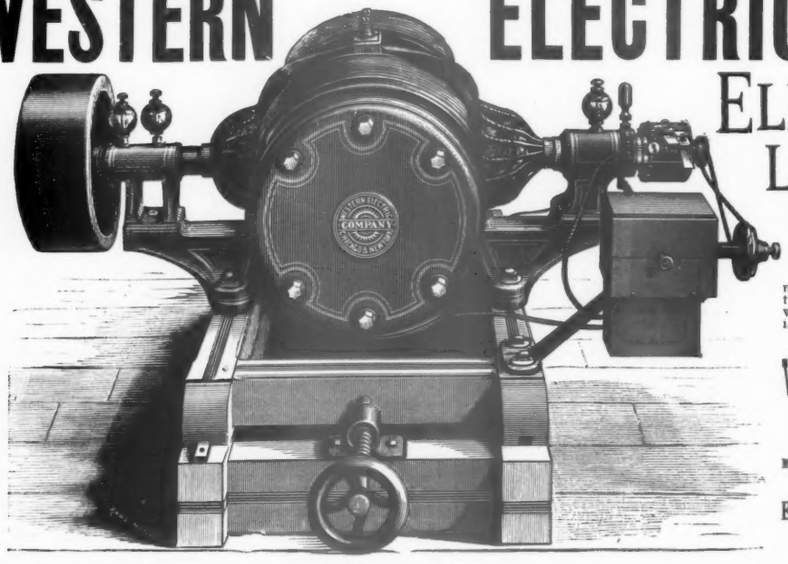

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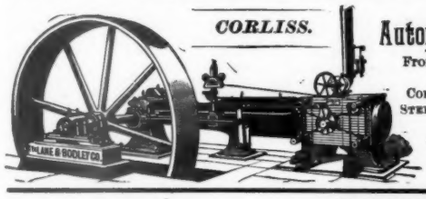

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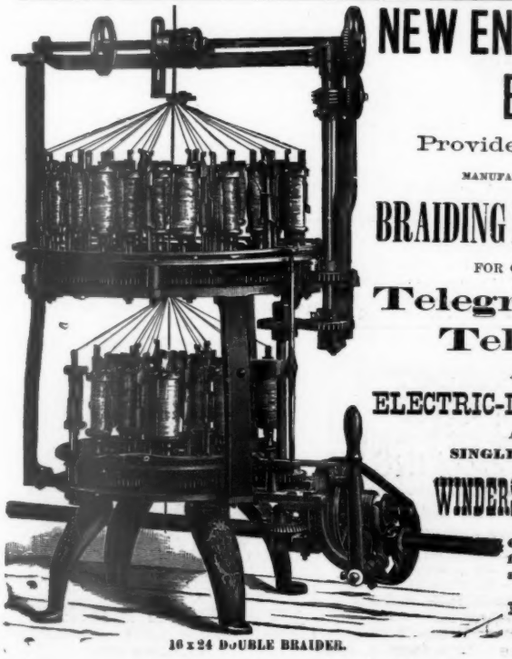

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